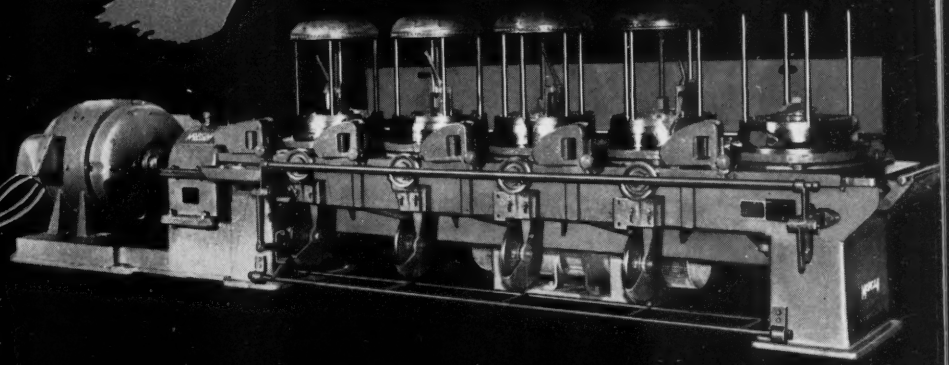
WIRE AND WIRE PRODUCTS

AUGUST 1948

Take a vacation from high costs....

Install Modern

MORGAN CONNOR WIRE MACHINES

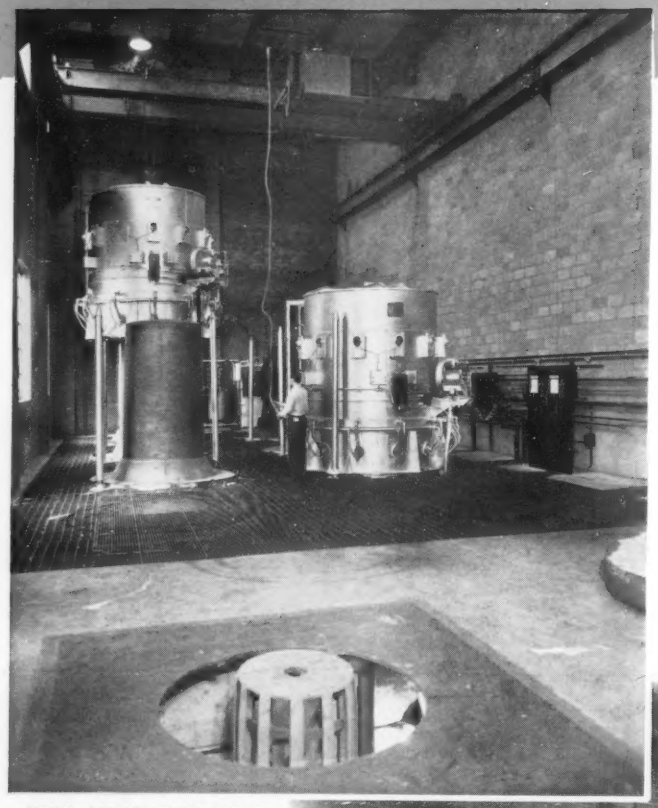


MORGAN CONSTRUCTION COMPANY

WORCESTER, MASSACHUSETTS

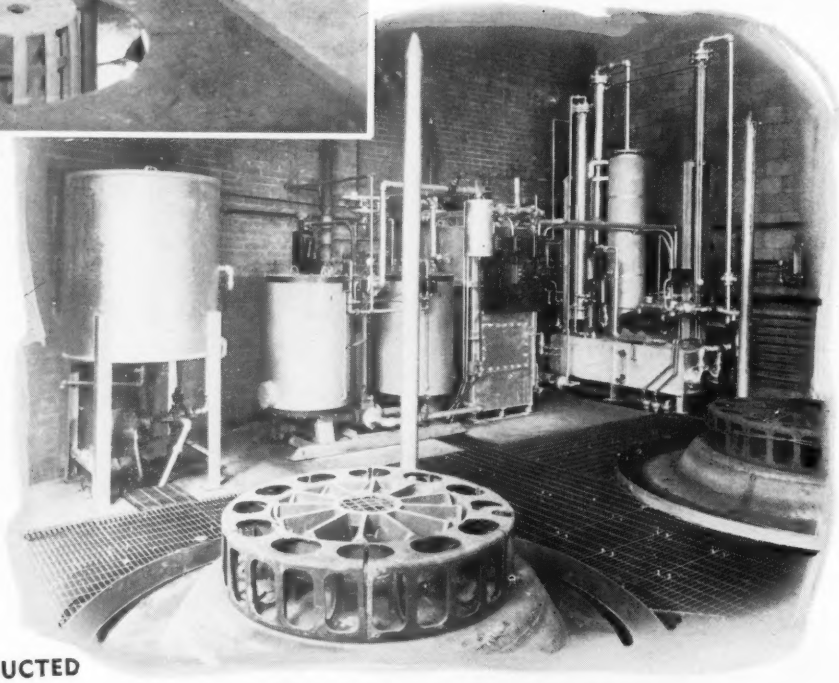
OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

The Lamson & Sessions Co.
HAS NOW COMPLETED ITS FACILITIES FOR *Spheroidizing* ROD AND WIRE COILS



NEW ANNEALING WING

THESE two Wilson cylindrical bell type furnaces and 6 bases provide this Cleveland plant of Lamson & Sessions with means of obtaining any required physical or metallurgical specification for cold heading rod or wire coils and to process the material without decarburizing.



DRY NITROGEN GENERATING EQUIPMENT

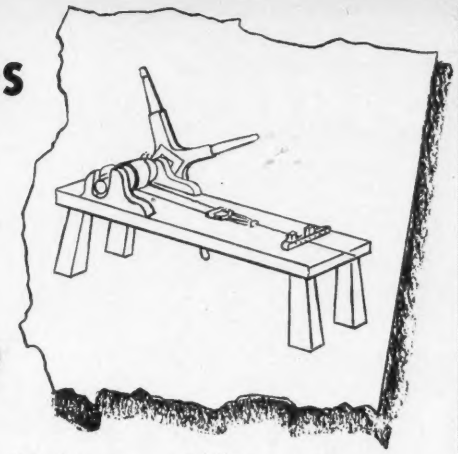
ENGINEERED AND CONSTRUCTED BY THE

Lee Wilson ENGINEERING Co., Inc.

20005 West Lake Road CLEVELAND, OHIO
Telephone ACademy 4670

INDUSTRIAL FURNACES + RADIANT TUBE HEATING + HEAT TREATING PROCESSES

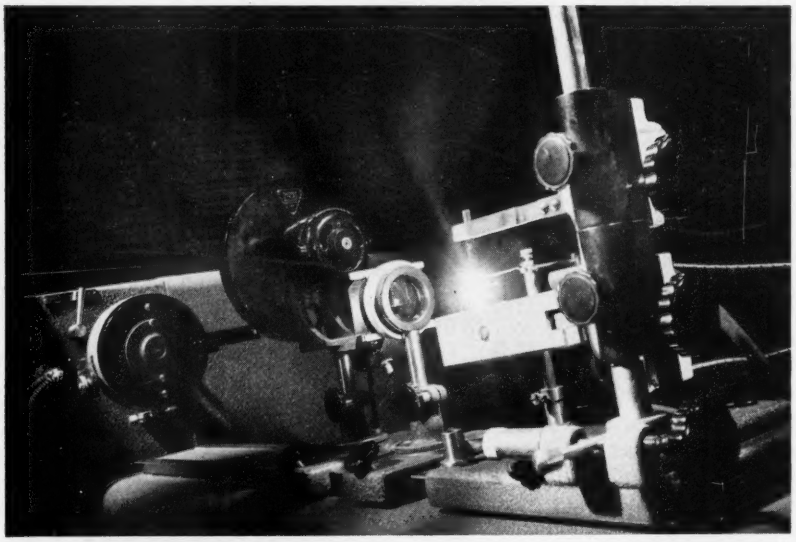
How many dies are backed by *29* quality tests?



A hundred years ago, when this two-man windlass was in use, *no* dies were rigorously tested, as Carboloy dies are today.

Then, limited production requirements didn't call for the extra long life and even textures so necessary today.

But *all Carboloy dies are* tested rigorously—for modern high speed equipment requires absolute assurance of quality, texture, and long life in wire, bar, and tubing dies. And so, in Carboloy Cemented Carbide dies, you can be sure of consistently high purity and quality.



Tnis photograph illustrates one of the 29 tests that assure you of getting, in Carboloy dies, the best in performance and long life.

This is the spectrographic test. It is used for making chemical analysis. It rapidly detects any impurities in the powder, and is important in process control.

Let us tell you more about these dies—and about Carboloy's extra benefits and assurances of quality. And ask for the Carboloy DIE SERVICE MANUAL D-119.

CARBOLOY COMPANY, INC., 11171 E. 8 MILE STREET, DETROIT 32, MICHIGAN

CARBOLOY®

CEMENTED CARBIDE

Corrosion ?

Tough forming jobs ?

Choose Bethanized

These strong, corrosion-resisting chains are a typical use of bethanized wire. The coating is not damaged by this forming operation.

You can do a better job with Bethanized wire. Here's why:

★ **IDEAL FOR SEVERE FORMING.** The pure, ductile zinc permits drastic deformation without danger of the zinc flaking off. The wire can be twisted, wrapped, even drawn to fine gauge.

★ **EXTRA CORROSION-RESISTANCE.** The uniform coating is tightly bonded to the steel wire. It locks out corrosion.

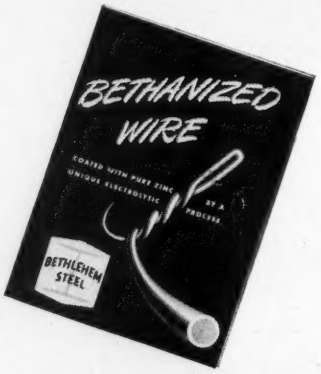
★ **SMOOTH, LUSTROUS APPEARANCE.** Here's extra sales appeal for a wide range of wire products.

★ **COATING WEIGHTS TO FIT THE JOB.** Any predetermined weight of zinc within practical limits can be applied.

★ **LONG COATING LIFE.** The zinc coating, deposited evenly atom by atom, is 99.9 pct pure.

★ **WIDE RANGE OF TEMPERS.** Whether temper must be hard or soft, the wire can be bethanized.

These unique advantages are yours when you specify Bethanized wire. Plan now to give it a test in your plant. Ask the nearest Bethlehem sales office for complete details or write us at Bethlehem, Pa.



Write for this folder describing Bethanized wire—its manufacture, uses, coating weights, how to test coating weights, etc. Address Publications Dept., Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

BETHANIZED WIRE

★ BETHLEHEM STEEL ★

WIRE & WIRE PRODUCTS. Vol. 23, No. 8, August, 1948. Publication Office, at 61 Cliff Street, New York 7, N. Y. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S., $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, June 14, 1946, at the Post Office, New York, N. Y., under Act of March 3, 1879.

here's the NEW PROTECTIVE COATING for live wires

MARVINOL VR-10, the versatile vinyl resin, offers superior stability in protective coatings from raincoats to jackets and coatings for wire. Here are some of the advantages it offers you . . .

MORE STABILITY . . . In processing and in end products, Marvinol offers you greater stability . . . superior resistance to heat, light, oils, acids, aging, wear and other normally destructive forces . . . more positive flexibility in low temperatures. High molecular weight gives Marvinol coats and jackets extra toughness and "dryness."

MORE VERSATILITY . . . Marvinol is easy to formulate for extruding, injection molding and many other processes . . . it's among the most versatile vinyl resins. Wire coatings made from Marvinol may be brilliantly or delicately colored . . . are easily cleaned.

MORE UNIFORMITY . . . Marvinol resins are a development of Martin research and Martin's quarter-century of plastics experience. Produced in the world's most modern chemical plant, they assure unexcelled uniformity. The Glenn L. Martin Company does not compound or fabricate in the plastics field. If you make or coat wire, our sales engineers and customer service laboratory offer full technical cooperation. If you buy or use finished wire, write to Chemicals Division, Dept. W-8, The Glenn L. Martin Company, Baltimore 3, Maryland.

Martin® Marvinol

RESINS, PLASTICIZERS AND STABILIZERS PRODUCED BY THE CHEMICALS DIVISION OF
THE GLENN L. MARTIN COMPANY • AN INTERNATIONAL INSTITUTION
"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN."

A Famous Trademark...

On A "Work-Horse" Air Cylinder At A "Work-Horse" Price!

DESIGNED by JLE engineers after years of research in pneumatics!

PRODUCED under same rigid supervision that governs all JLE equipment!

TESTED and approved on JLE equipment used throughout the wire industry!

LOW-COST AIR CYLINDER FEATURES

1. Available in standard bore sizes from 1½" to 10" diameter. Can be made in any stroke specified. Has top operating pressure of 110 lbs. per sq. inch.
2. Available in four standard mountings. Standard piston rod attachments available.
3. Can be furnished single or double-acting.
4. Cushioning can be supplied on either one or both ends, if desired.

Ask for complete JLE Air Cylinder details and prices —

JAMES L. ENTWISTLE CO.

43 CHURCH STREET, PAWTUCKET, RHODE ISLAND

30 YEARS OF SERVICE TO THE WIRE INDUSTRY

Canadian Representatives:
THE A. R. WILLIAMS MACH. CO., LTD.
64 FRONT ST. W.
TORONTO, ONT.

British Associates:
GENERAL ENGINEERING CO., LTD.,
BURY ROAD, RADCLIFFE,
LANCS., ENGLAND

...10 TIMES EACH WAY!

Chase wire for cold-heading passes this GRUELING TEST every day!

As one of the means of assuring you the very best quality wire, each Chase copper-alloy wire coil is subjected to this severe twist and reverse twist test.

No seams, slivers or other surface physical defects can hide from *this* searching test. And it's just one of many! Chase wire for cold-headed products is also subjected to a compressing or upsetting test that simulates a very severe heading operation.

In addition, Chase wire must be uniform in surface texture and color, have accurate dimensions, be precisely tempered. And there's a Chase copper-alloy wire for *every need!* Write the nearest Chase Warehouse or Service Office, and be *sure* of the best.

Chase

the Nation's Headquarters for
BRASS & COPPER

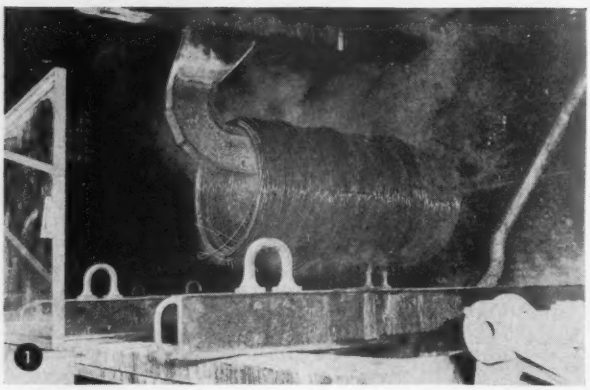
WATERBURY 91, CONNECTICUT — SUBSIDIARY OF KENNECOTT COPPER CORPORATION

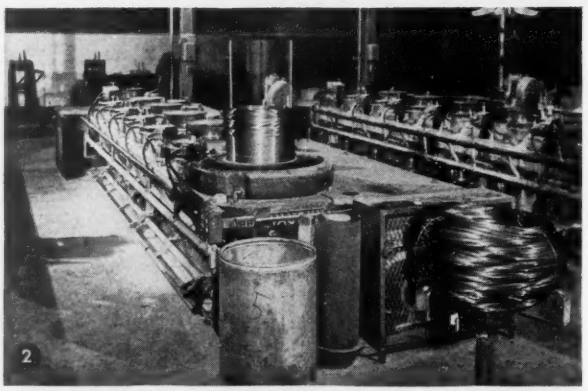
THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS
NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WATERBURY (†Indicates Sales Office Only)

This Wire Mill Cleaning House Has No Lime Tanks

Because They Use Magnus Metal Coat 267





Photographs courtesy National-Standard Company

THIS cleaning house of the National-Standard Company is the first ever built to conform to the modern practice of *limeless* wire drawing. All the expense and mess of liming and baking are eliminated.

Procedure

Pinned coils of ♯5 rod are pickled, then rinsed with high pressure cold water. Rinsed rod is immersed for 3 minutes in the solution of Metal Coat 267 (14 oz. to 267 gal. of water) heated to 200° F. Pins of rod from the washing tank are drained for a few seconds (see photo ♯1 above), and then conveyed to hot air driers where rod is dried for one minute. From here it goes to the rod drawing machine where rod is drawn down to .125" (at a speed of over 1,000 feet per minute). It then goes to the heat treating furnace and thence back to the cleaning house where the entire process of pickling, coating and drying is repeated. It is then drawn to finished size on 6- to 7-hole machines down to .037", at a speed of more than 1,500 feet per minute. Photo ♯2 shows the 6-7 hole machines used for the high carbon tire bead wire.

Time Saving

From the time the rod or wire is dipped into the Metal Coat 267 solution to drawing only 15-20 minutes is required. Contrast this with the 4-6 hours which would be needed for lime-coated rod. There's no baker bottleneck.

Other Advantages

The Metal Coat 267 bath removes hydrogen embrittlement. You can store wire that has been coated with ♯267 for an indefinite period without rusting. And you certainly will get cleaner working conditions, as evidenced by the very clean floor shown in photo ♯2.

Magnus Metal Coat 267 offers you better finished wire at a much lower over-all cost per ton than you can get by conventional methods.

Write for complete data!

MAGNUS CHEMICAL CO., INC.
188 South Avenue · Garwood, New Jersey
IN CANADA — MAGNUS CHEMICALS, LTD.
4040 Rue Masson, Montreal 36, Que.

OTHER MAGNUS DRAWING SPECIALTIES

For ordinary dry drawing, Dri-Draw ♯6
For bright wire drawing, Dri-Draw ♯91
For non-foaming wet drawing — Wet Draw ♯40-F, especially developed for high speed continuous wet drawing machines.

IN WIRE DRAWING—IT'S

Magnus

CLEANERS • EQUIPMENT • METHODS

STRENGTH
and FLEXIBILITY
Always "Firsts" in
Youngstown Rope Wire
When Lake Freighters Load
ANYTHING that speeds up loading and unloading increases freighter profits and improves service to customers.
That's one reason why preformed wire rope woven from Yolectro High Carbon Rope Wire is so widely used in crane service. The strength, flexibility and uniform gauge of the wire contribute to a strong, flexible rope which flows smoothly over sheaves and speeds up crane operation.
Specify Yolectro High Carbon Rope Wire for dependable, long-lived wire rope. Strong, flexible and uniform in gauge, this wire also has excellent corrosion-resistance properties and toughness to resist abrasion. Like all other Youngstown wire mill products, Yolectro High Carbon Rope Wire is produced from the finest quality steel, refined, rolled and drawn to exacting specifications.
NET TONS 2778
3582
QUALITY
YOUNGSTOWN
SERVICE
Photo by courtesy of the Preformed Wire Rope Information Bureau.
YOUNGSTOWN
THE YOUNGSTOWN SHEET AND TUBE COMPANY
GENERAL OFFICES - YOUNGSTOWN 1, OHIO
Export Offices - 500 Fifth Avenue, New York City
Manufacturers of
CARBON - ALLOY AND YOLOY STEELS
Bars - Rods - Wire - Cold Drawn Carbon Steel Rounds - Electrolytic Tin Plate - Coke Tin Plate - Pipe and Tubular Products - Sheets - Plates - Conduit - Tie Plates and Spikes.

Custom built spools for high speed winding

Mercury testing for continuity of film

Checking raw materials

Don't "fool around"... USE DEPENDABLE WIRE PRODUCTS!

A product, too, is only as strong as its weakest part. Follow the practice of leading designers and engineers by specifying only service-giving wire . . . wire that has built up a reputation for "delivering the goods under fire."

Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values, Hudson Wire products will probably lower your production costs considerably. Check these three points:

QUALITY — All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.

UNIFORMITY — By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.

SERVICE — If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.

Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples, and Litzendraht

HUDSON WIRE CO.

Winsted Division

WINSTED CONNECTICUT

Grinding Springs?

You Can Grind More, for Less... with NORTON Vitrified Discs!

Because:—

- They cut hardened steel fast and cool
- They minimize the danger of burrs, burning or distortion
- They remain flat and sharp
- They resist grooving
- They require a minimum of dressing

These cost-cutting qualities, present in all Norton dies, are the result of extensive Norton research which has determined the exact abrasive and bond combination required to produce fast, economical results on every type of spring grinding job. Especially popular are discs of tough, sharp 57 ALUNDUM abrasive or the sensational, new 32 ALUNDUM abrasive (Regular or Open Structure) with vitrified bond.

Because these discs cut cool and fast without danger of burrs, burning or distortion, they produce more usable springs per hour—reduce the number of rejects.

They are available in all standard sizes (15" to 72" in diameter), and with all types of mountings (including plate mounted and inserted nut).

Your Norton abrasive engineer or distributor will be glad to help you select the right Norton discs for each of your spring grinding jobs.

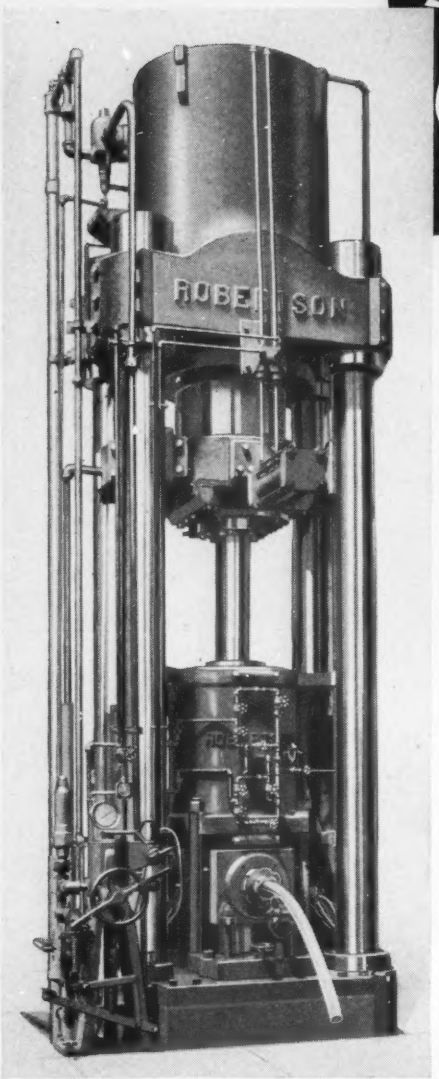
NORTON COMPANY ◆ WORCESTER 6, MASS.

Distributors In All Principal Cities

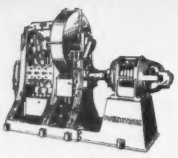
W-1186

NORTON ABRASIVES

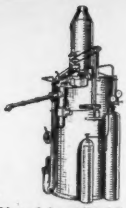
They're "GEMS" of Craftsmanship



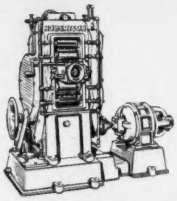
We design and build all types of lead encasing machinery and hydraulic equipment including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies, and Cores, Lead Sheath Stripping Machines and Special Equipment for Special Uses.



Hydraulic Pump



Closed Lead Melting Pot



Lead Sheath Stripping Machine

...they're Robertson

Designed and built by master craftsmen constantly mindful of the ultimate application of Robertson Equipment. It is this recognition of your problems plus the accumulated knowledge and experience of more than 89 years' specialization in the design and manufacture of high pressure hydraulic equipment that assures steady, uniform output . . . lower operating and maintenance costs. Let us help you solve your lead encasing problems.

JOHN Robertson COMPANY INCORPORATED

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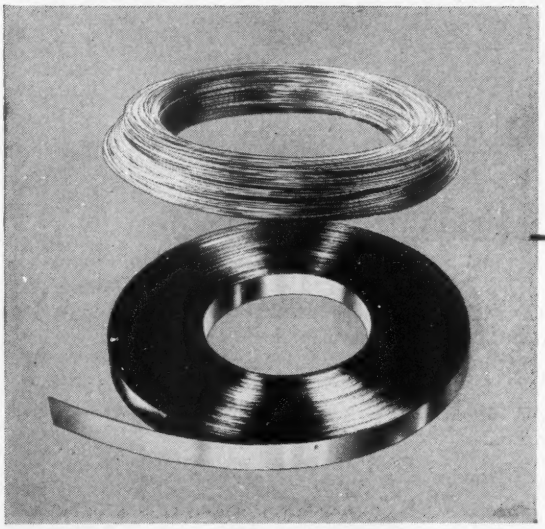
Designers and Builders of all Types of Lead Encasing Machinery Since 1858



ATOP THE WORLD'S TALLEST BUILDING . . . yet not high enough! Television's need for unobstructed, long-range broadcasts may be met by planes in the stratosphere, relaying signals from the earth. Engineers working on this problem are confident of ultimate success.

With like confidence, Roebling blazes new trails in developing and making products vital to communication and all other industries. And the widespread confidence reposed in Roebling is our most guarded asset. Leadership is maintained only by constant progress . . . our ideal is to make Roebling products and engineering service the best obtainable anywhere, *any* time.

MILES LONG—AND EVERY INCH ALIKE!

SAME GAUGE, SAME FINISH, same analysis and strength from end to end... that's Roebling Wire! And because it's *uniform,* you can adopt it with complete confidence that it will give you peak production . . . eliminate unnecessary stoppages and cut down reject costs.

Whatever your requirements may be, Roebling probably makes a wire that meets them exactly. Flat, round or shaped it's available now—ready for immediate use in today's production.

Your Roebling Field Man has a broad practical knowledge of wire and the fabrication of wire products. He will be glad to help you choose the *right* wire for specific applications—aiming always at top performance and maximum economy. Write or call him at your nearest Roebling branch office.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

A CENTURY OF CONFIDENCE ROEBLING

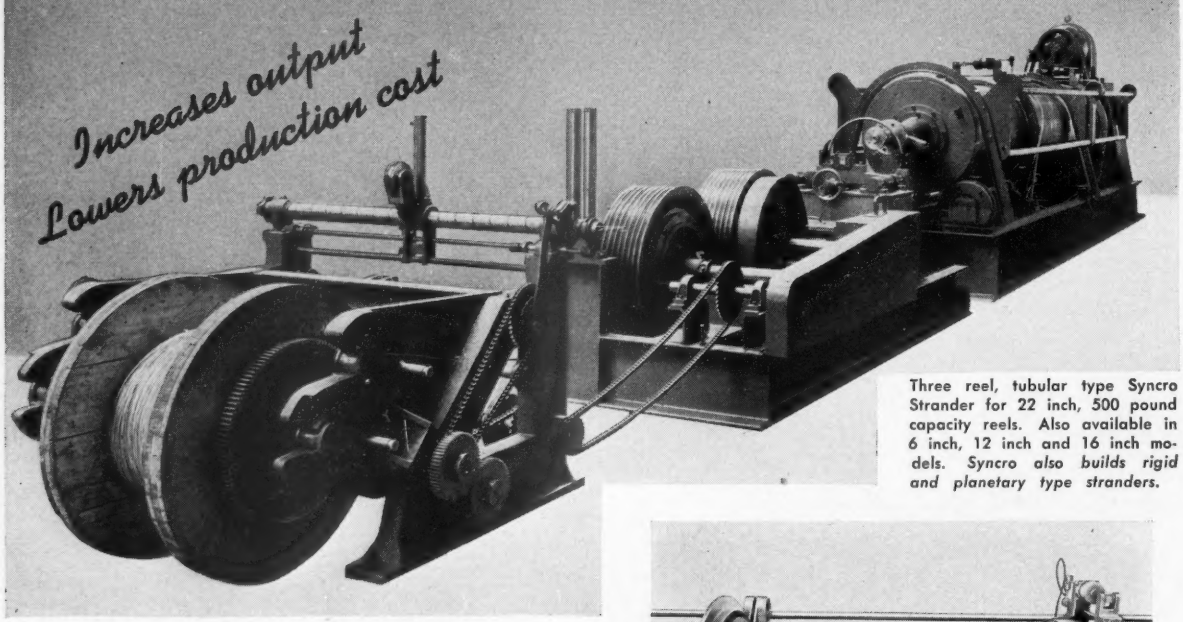
JAR ROEBLING

★ *WIRE ROPE AND STRAND* ★ *FITTINGS* ★ *SLINGS* ★ *SUSPENSION BRIDGES AND CABLES* ★ *AIRCORD, AIRCORD TERMINALS AND AIR CONTROLS* ★ *AERIAL WIRE ROPE SYSTEMS* ★ *ELECTRICAL WIRE AND CABLE* ★ *SKI LIFTS* ★ *HARD, ANNEALED OR TEMPERED HIGH AND LOW CARBON FINE AND SPECIALTY WIRE, FLAT WIRE, COLD ROLLED STRIP AND COLD ROLLED SPRING STEEL* ★ *SCREEN, HARDWARE AND INDUSTRIAL WIRE CLOTH* ★ *LAWN MOWERS*

SYNCRO HIGH SPEED STRANDER

STEPS UP ROTOR TO 500 R.P.M.

Increases output
Lowers production cost



Three reel, tubular type Syncro Strander for 22 inch, 500 pound capacity reels. Also available in 6 inch, 12 inch and 16 inch models. *Syncro also builds rigid and planetary type stranders.*

THE SYNCRO TUBULAR STRANDING MACHINE — an assembly of outstanding features — expertly designed and engineered for peak production and smooth performance.

SIMPLIFIED ROTOR is patented, spider mounted; dynamically balanced for smooth, vibration free operation.

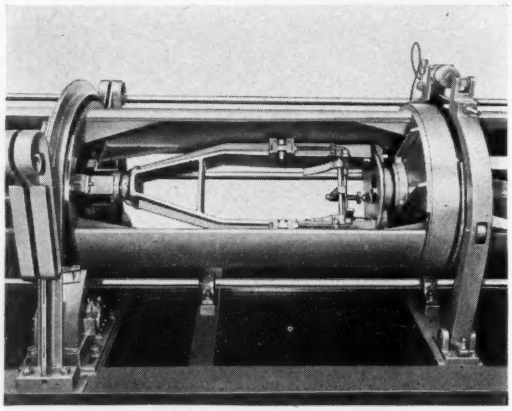
METAL WIRE GUIDE SHOES, close grain, low friction, large radius eliminate sharp bends.

AIR OFF-SPRING SET BRAKES provide rapid deceleration—quick stops.

EIGHT DIFFERENT PITCH LAYS are possible with the one set of gears.

QUICK ACTING REEL BLOCKS are dependable.

GROOVED CAPSTANS (30") are either gear or variable speed driven.



The simplified rotor and spider mounting.

TAKE-UP UNIT is either friction driven from capstan or operated by independent motor.

NON-METALLIC SUPPORT ROLLS suppress noise.

ALL BEARINGS are anti-friction for longer, smoother action.

Machinery for the Wire Industry

1779

SYNCRO MACHINE COMPANY

611 Sayre Avenue Perth Amboy, N. J.

Affiliated Company

Winget-Syncro, Rochester, Kent, England

Standardize on SYNCRO

There's a standard Syncro machine for every wire drawing need, from rod to fine wire—from strands to cable.

Talide
(TUNGSTEN CARBIDE)
Drawing Dies
20 to 100 Times the Life of Steel Dies
DRAWING DIES
(For Wire, Tubing and Bar Stock)
SPINNING AND CURLING ROLLERS
PIERCING AND LAMINATION DIES
UP TO 24" I.D.
SWAGING DIES
(For Forming Solid and Tubular Shapes)
POWDER METALLURGY DIES (For Compacting Powdered Metals and Materials)
BLANKING AND FORMING DIES
(For Stamping Lamination Discs, Metals, Plastics, Paper)
Talide
(TUNGSTEN CARBIDE)
Performance!
TUBE MANDRELS
HEADING AND EXTRUSION DIES
(For Shaping and Sizing Bolts, Nuts, Screws, and Collapsible Tubes)

Isn't low unit cost your ultimate objective? You get more speed and output on long production runs and at lower maintenance cost with the superior quality of Talide Dies. Talide Dies out-perform and out-wear steel dies 20 to 100 times. Talide (the hardest metal made) saves up to 50 hours polishing and redressing time on a single die. And, since Talide Metal takes and imparts the smoothest finish possible, surface defects are practically eliminated. Purchase Talide (tungsten carbide) Dies in any practical shape and of inside diameter up to 24".

Write for Die and Wear Part Catalog 46-WP.

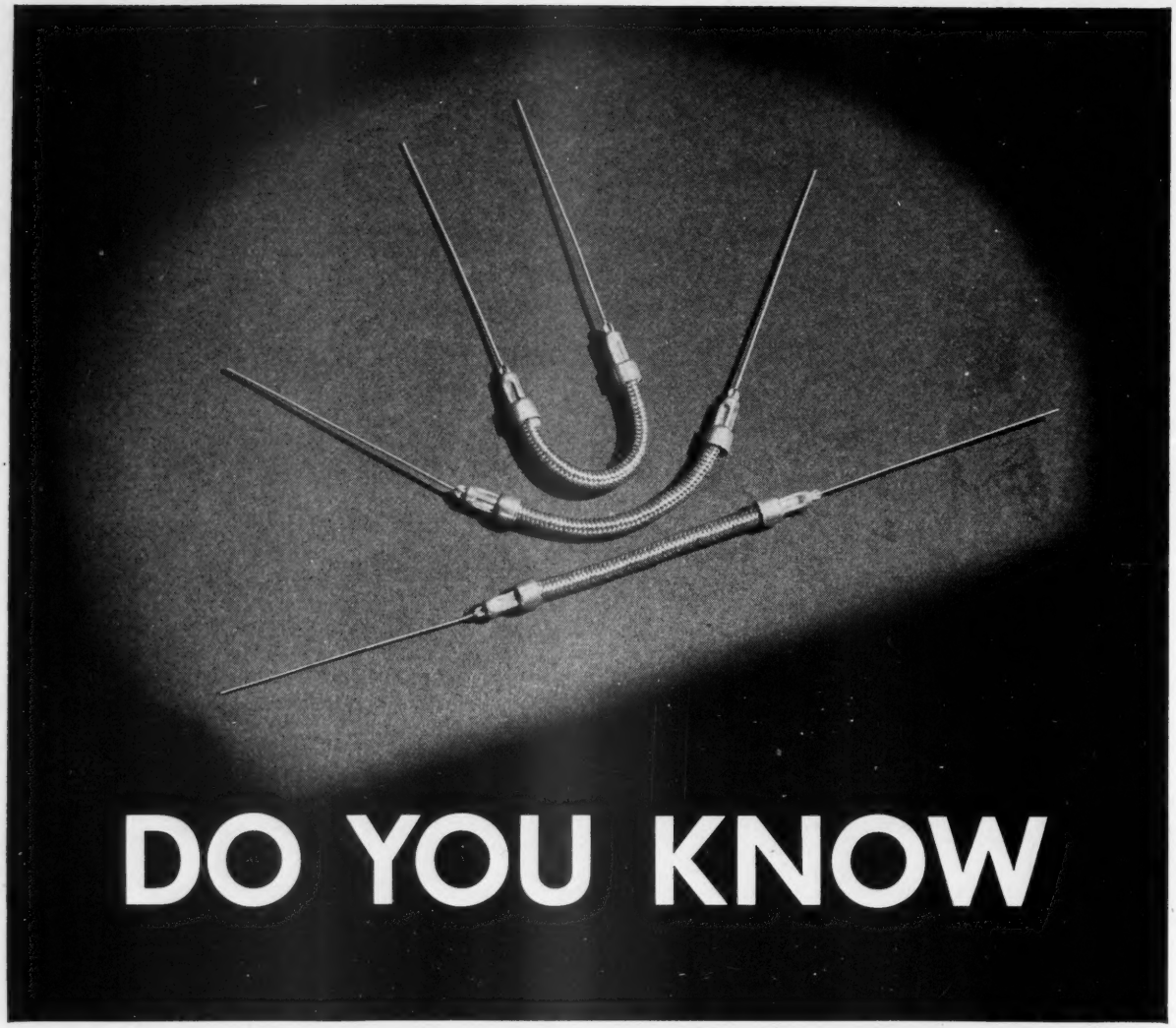
TALIDE METAL MEETS EVERY REQUIREMENT

SINTERED CARBIDES
METAL CARBIDES CORPORATION
MC
TALIDE
YOUNGSTOWN, OHIO
HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS



DO YOU KNOW

. . . THAT FIBERGLAS* YARNS USED AS CORES AND BRAIDS FOR FLEXIBLE RESISTORS OFFER:

- **Increased Flex Life**
- **High Heat Resistance**
- **Improved Yarn Application Efficiency**
- **Low Material Cost**

For complete information about Fiberglas Yarns, for these, and other electrical uses, write Owens-Corning Fiberglas Corporation, Dept. 875, Toledo 1, Ohio. Branches in principal cities.

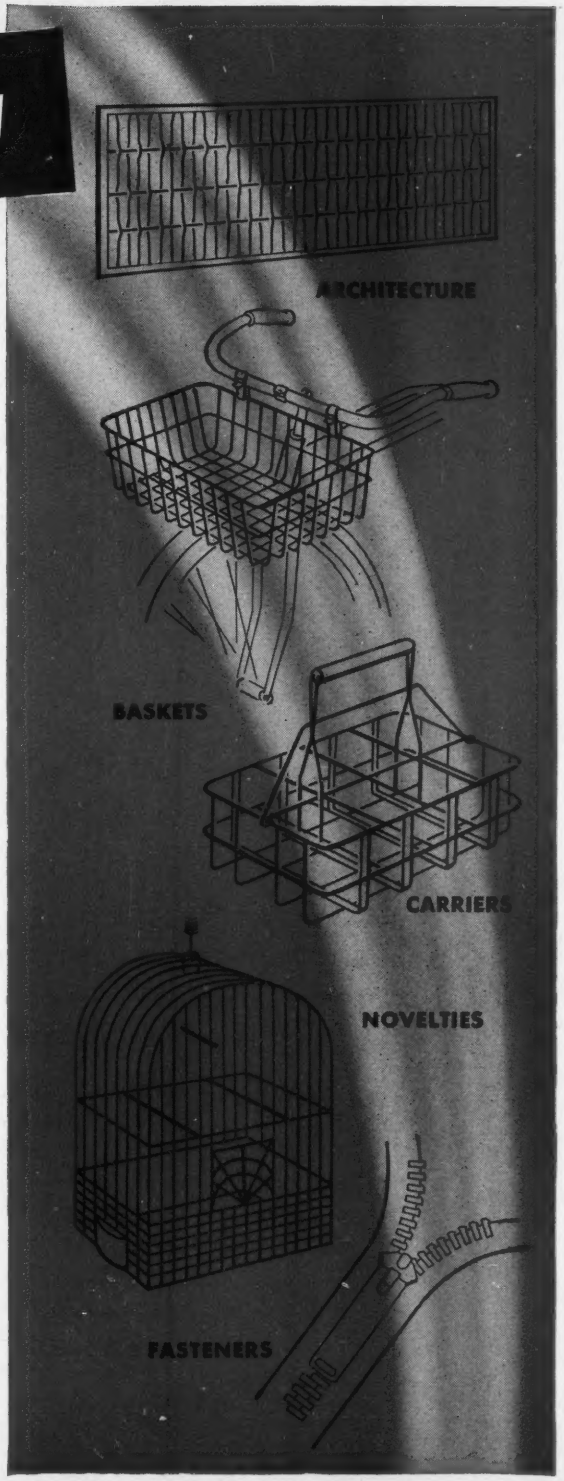
In Canada: Fiberglas Canada Ltd., Toronto, Ontario

OWENS-CORNING FIBERGLAS Yarns

T.M. REG. U.S. PAT. OFF.

***Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) for a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.**

Any color of the Rainbow *in* ALUMINUM WIRE GOODS



Get brilliant colors *into* your aluminum wire goods with the patented Alumilite* finish. The color is *in* the metal surface, cannot chip nor peel. Will withstand severe wear. You have your choice of any color in the rainbow

The light weight of aluminum . . . only ⅓ as much as steel or brass . . . gives extra sales appeal to wire articles. Aluminum wire is strong, can be fabricated and joined on your present equipment. Add to these advantages the lasting beauty of aluminum in either the natural or colored Alumilite finish, and your products take on even greater sales appeal.

And remember . . . a foot becomes a yard when you switch to Alcoa Aluminum Wire . . . three times as many feet of wire per pound as with steel, copper, or brass.

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reputable, well-equipped plants in leading cities are licensed and supervised by Alcoa to apply the patented Alumilite finish to aluminum. Write us for the name of the Alumilite licensee nearest you.

*Patented Process

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ALCOA 1888 | 1948 60 YEARS OF SERVICE

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Wire Saturating and Finishing Systems
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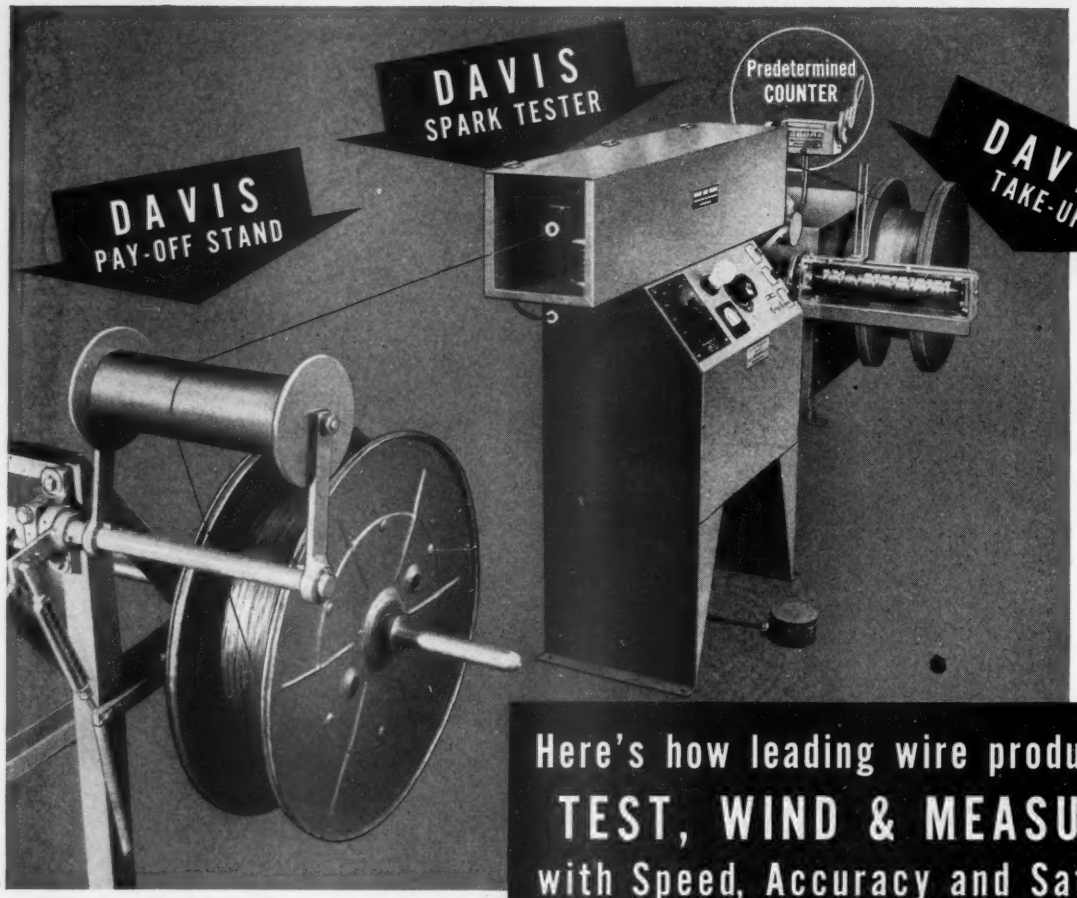

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Simple, All-Automatic Operation!

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- Electrically measures predetermined lengths, and stops when pre-set run is completed!
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- Worthington All-Speed Drive feeds at 100 to 1500 feet per minute. Other speed ranges available.
- Equipped with automatic brake!
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- Motor-driven adjustable traverse with width-adjusting stops!

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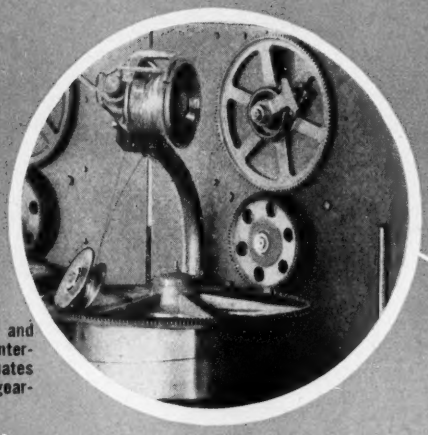
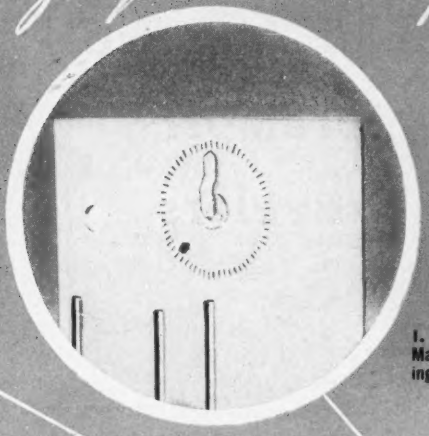
SPARK TESTERS • SPOOLERS • TAKE-UPS • CAPSTANS

Aetna-Standard Multi-Unit Wire Drawing Machine

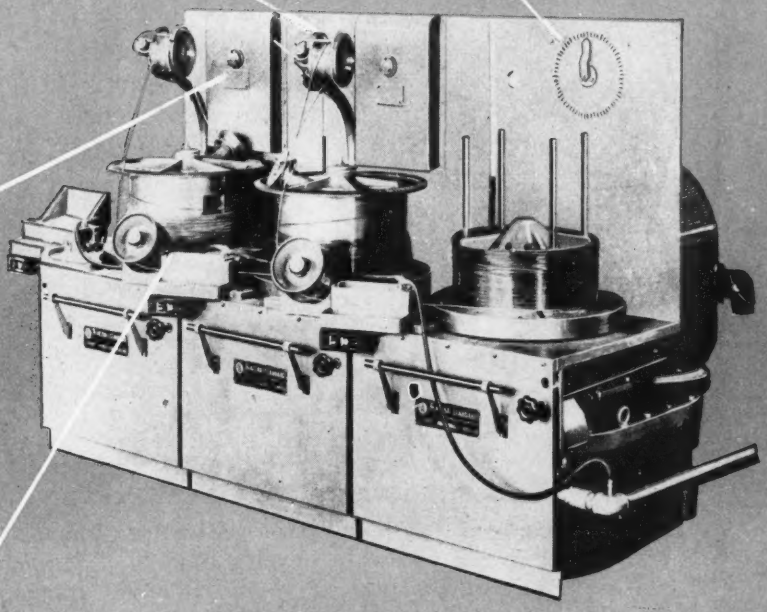
Auto-rheostatic synchronizing control system

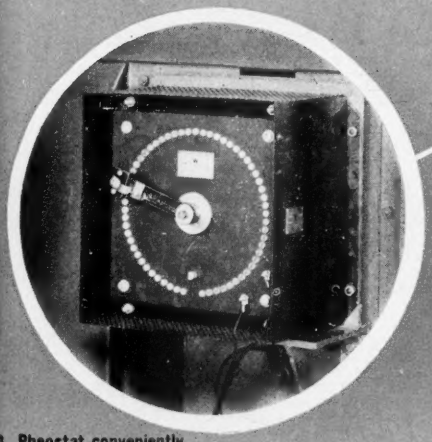


2. Floating sheave and ring gear at top of intermediate block actuates rheostatic control gearing automatically.

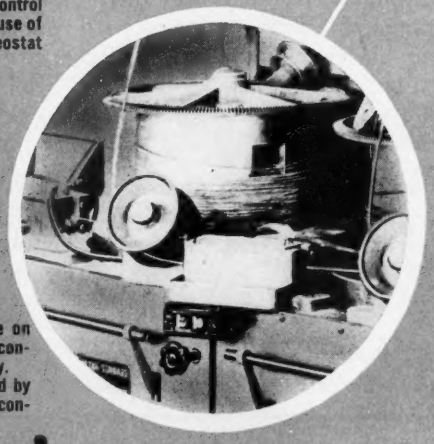


1. Visual dial and pointer for Manual setting of wire drawing speed of finishing Unit.





3. Rheostat conveniently mounted on rear of backplate above vertical motor. Control mechanism permits full use of complete range of rheostat and motor.



4. Ample reserve of wire on each block maintained at constant height automatically. Wire reserve can be varied by auxiliary manual rheostat control knob on each unit.

Heart of the automatic operation of two or more Aetna Units in tandem, centers in the auto-rheostatic synchronizing control, which automatically synchronizes block speeds to compensate for the elongation of the wire through successive drawing dies.

It is easy to operate. Once threaded, the Units will run automatically and continuously as long as a continuous strand of rod or wire is being supplied.

The Aetna Unit is available in four sizes (Nos. 30 - 22 - 16 - 12) for the production of heavy, medium, and light gauges of wire.

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THE AETNA-STANDARD ENGINEERING COMPANY

YOUNGSTOWN, OHIO

ASSOCIATED COMPANIES:

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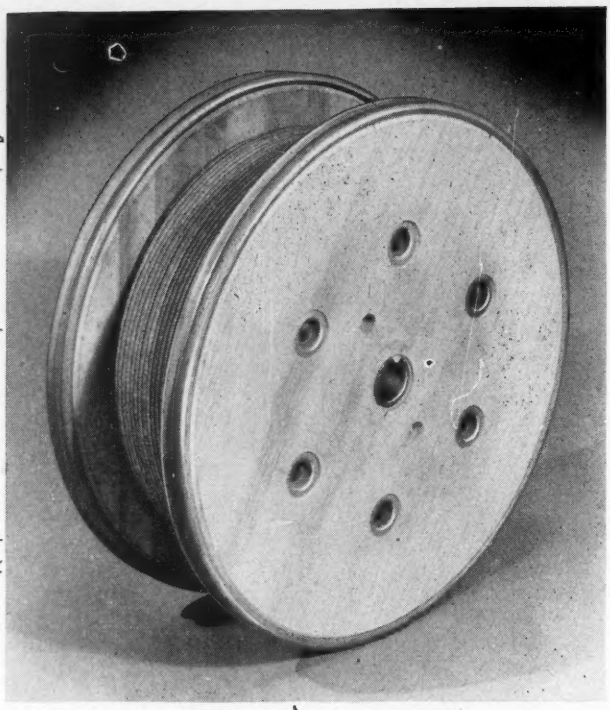

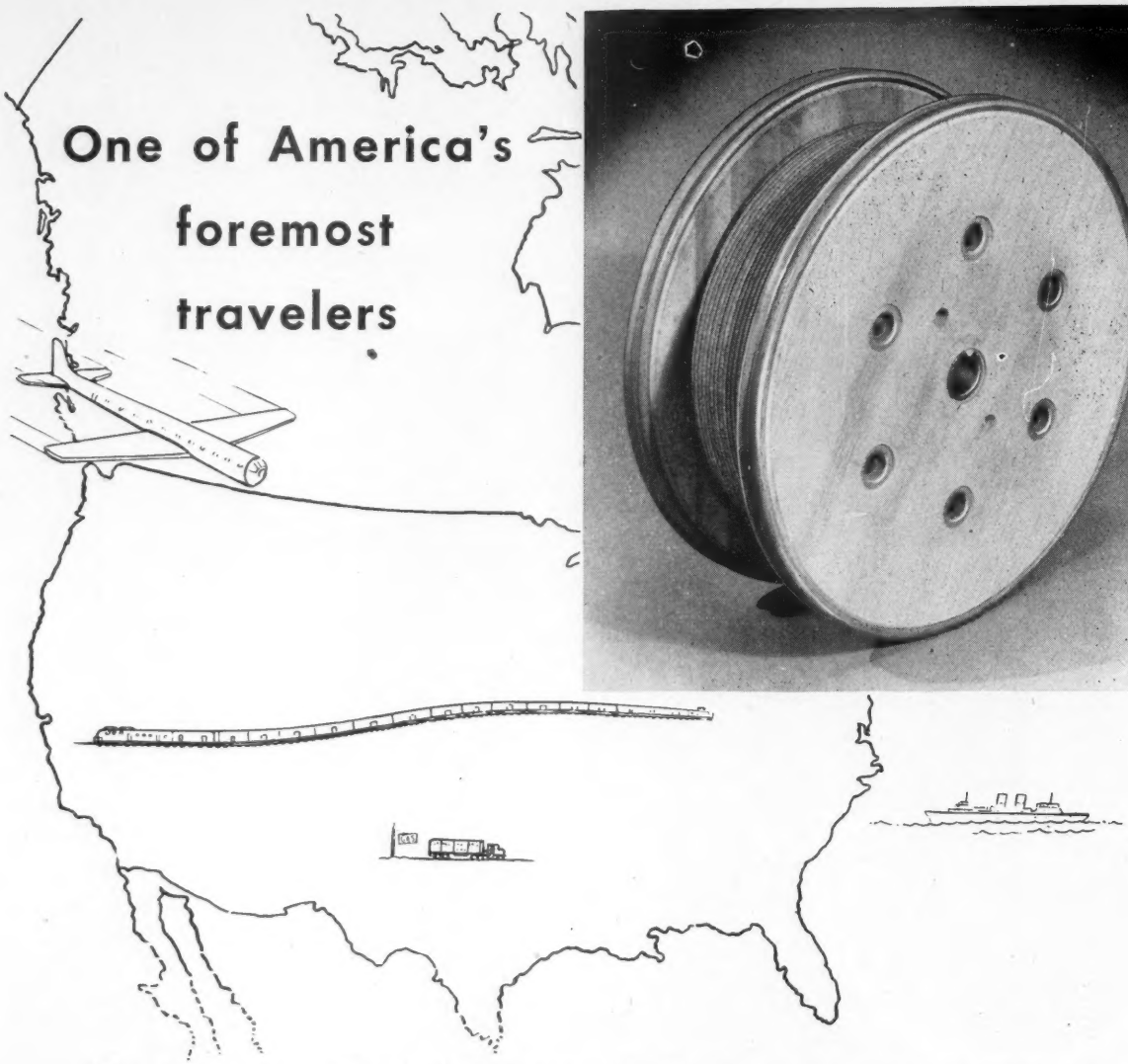

The thousands of Hubbard shipping spools in use probably travel a total of more millions of miles per year than any other industrial product. Added to that, they probably take more abuse and heavy handling than any other type of shipping unit. In spite of that, they stand up for months and years, providing a dependable low-cost means for shipping wire . . . and providing wire mill customers with an easy method for handling wire when received.

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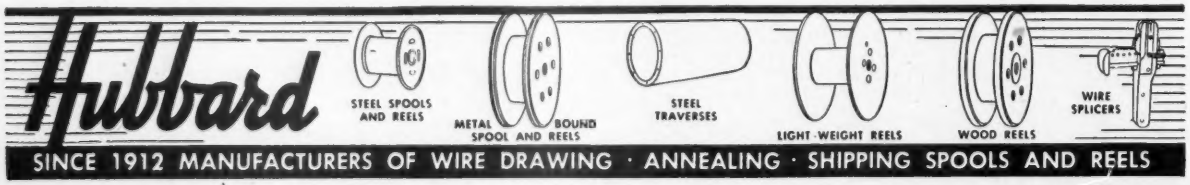

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Solution

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IMPROVE QUALITY

CUT OPERATING COSTS

Due to outstanding performance particularly in high speed, continuous plating operations, General Chemical's Zinc Fluoborate Solution has fast won an important place in the electroplating industry. The superiority of this General Chemical Research development to other commercial zinc baths is indicated by the unusual characteristics of the fluoborate electrolyte as well as by the type of deposits obtained. Learn more about Zinc Fluoborate and what it can mean to you in faster, more economical operations. Send today for the helpful literature described below.

SPECIAL FEATURES of Zinc Fluoborate

- Gives excellent adherence, uniform coverage, semi-lustrous finish
- Possesses high conductivity
- Permits use of high current densities

ADVANTAGES

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General Chemical Technical Information Manual ZF-1 contains extensive data on high speed, and tank and barrel plating with Zinc Fluoborate, including operating details, bath make-up, analytical methods, etc. For free copy, write General Chemical Fluorine Division, 40 Rector Street, New York 6, N. Y., or nearest Office listed below.

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COLD DRAWING PRODUCTION
means
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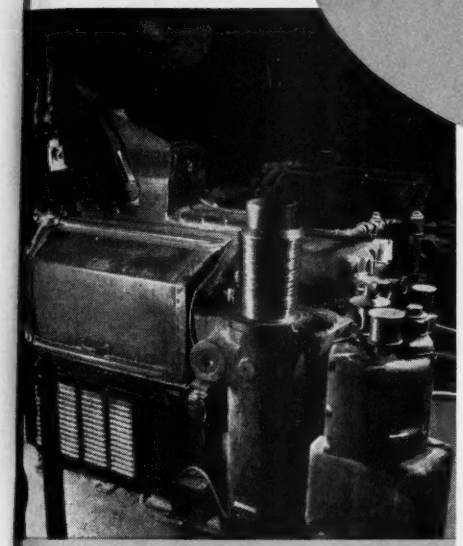

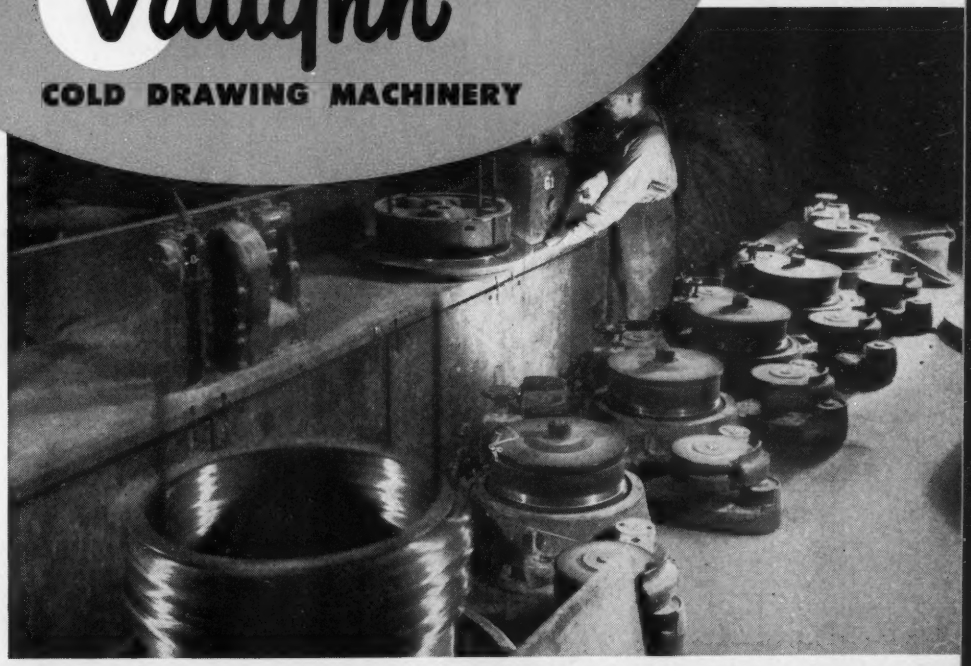

High-level output of cold drawn products is maintained consistently by Vaughn Cold Drawing Machinery — engineered and built to stand the gaff under constant production pressure. Check with us on the interesting reasons - why!

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PROFITABLY USED BY LEADING PRODUCERS SINCE 1871

THE VAUGHN MACHINERY COMPANY, CUYAHOGA FALLS, OHIO, U. S. A.

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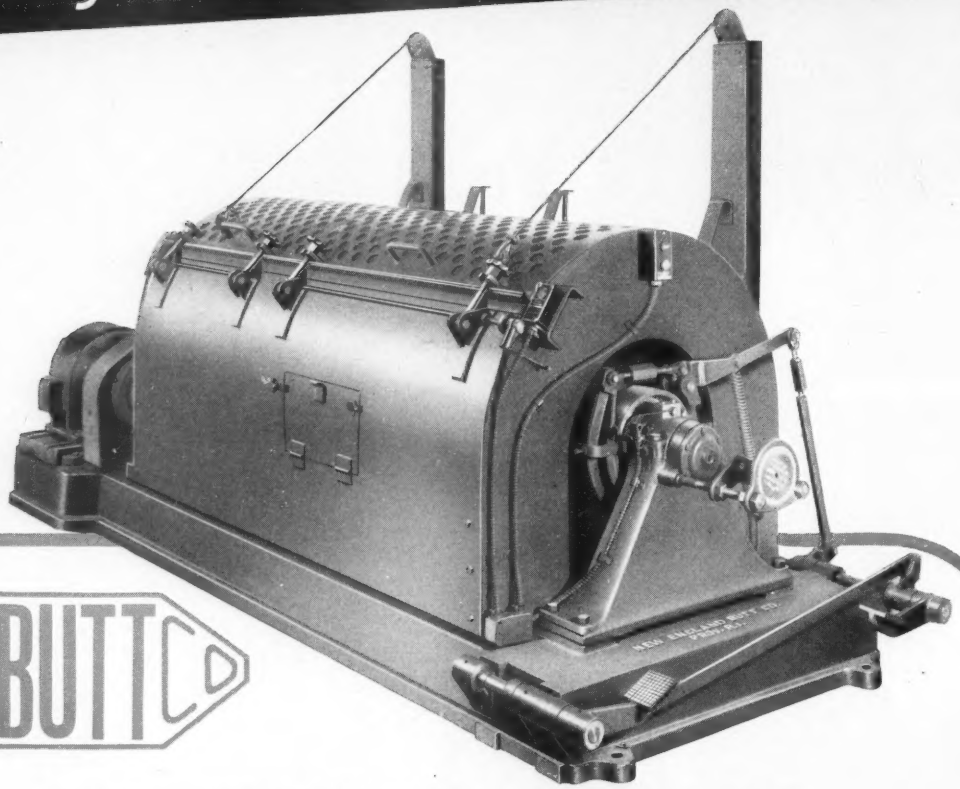
Give your Production a New Twist!



NE-BUTT CD

HERE'S THE HIGH SPEED BUNCHER FOR FAST, ECONOMICAL TWISTING OF SMALL WIRES

Check these big features:

- ☐ Two twists produced at each revolution
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- ☐ Quick acting electrically operated brakes
- ☐ Push button control station
- ☐ Substantial guards and safety features
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Butt High Speed Bunchers are made in two sizes: S-31 for strands up to No. 14; S-35 for strands up to No. 8. *For further details write for Circular No. 63.*

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Established 1842

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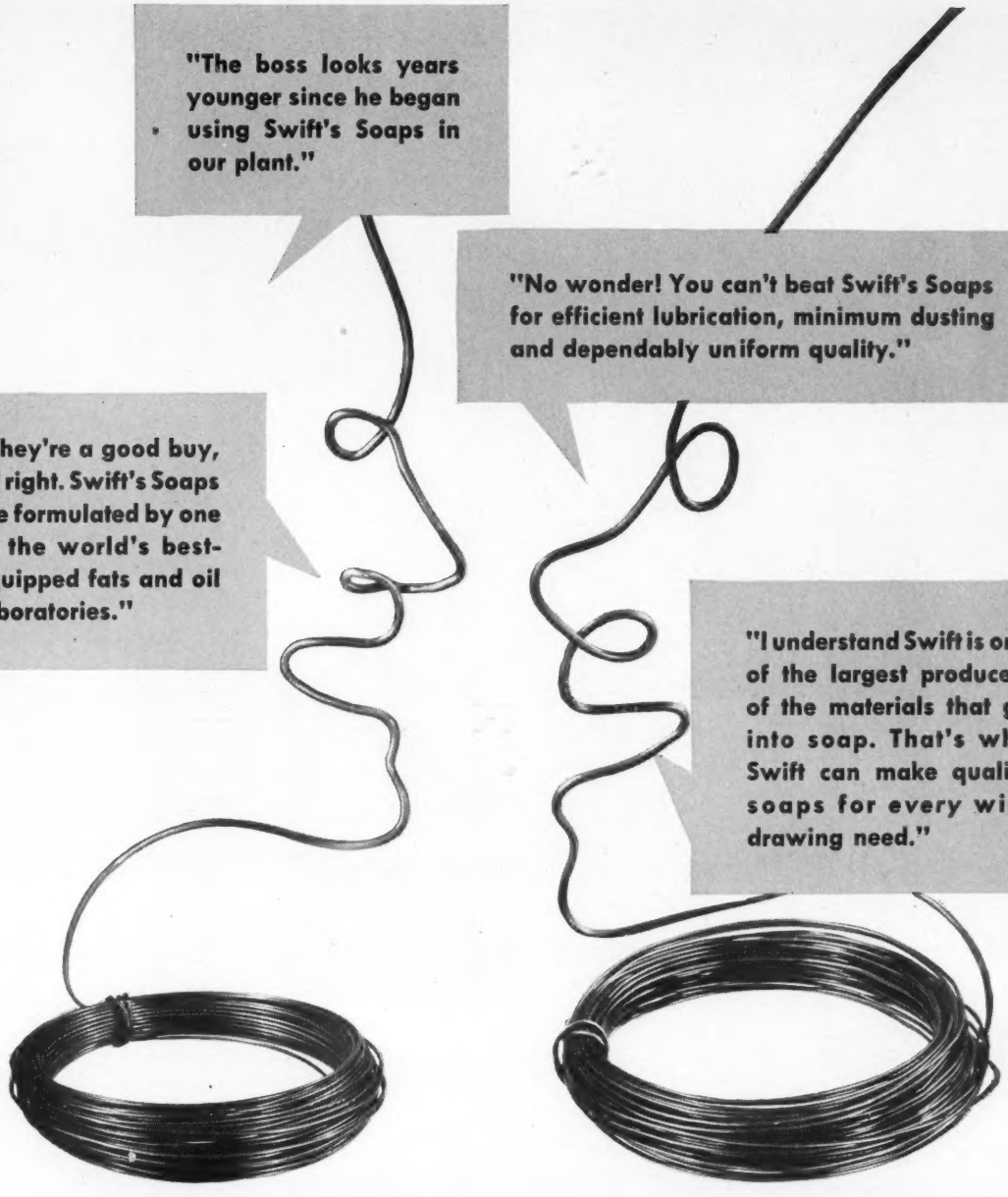

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Wire that speaks after it's spoken to!

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Wire for home recording sets not only must be strong and rustless, but must have special magnetic properties for good reproduction. ARMCO Research men worked closely with manufacturers of recording wire in developing a stainless steel with the precise magnetic quality needed for brilliant, noise-free recording.

This is only one of the many special-purpose stainless steel wire grades produced by ARMCO. There are more than 60 standard and special grades, drawn in many shapes and sizes. You can specify ARMCO Stainless Steel Wire of various tempers, wire with exceptional resistance to heat and corrosion. With it all your products will have the proved extra sales advantages of Stainless Steel.

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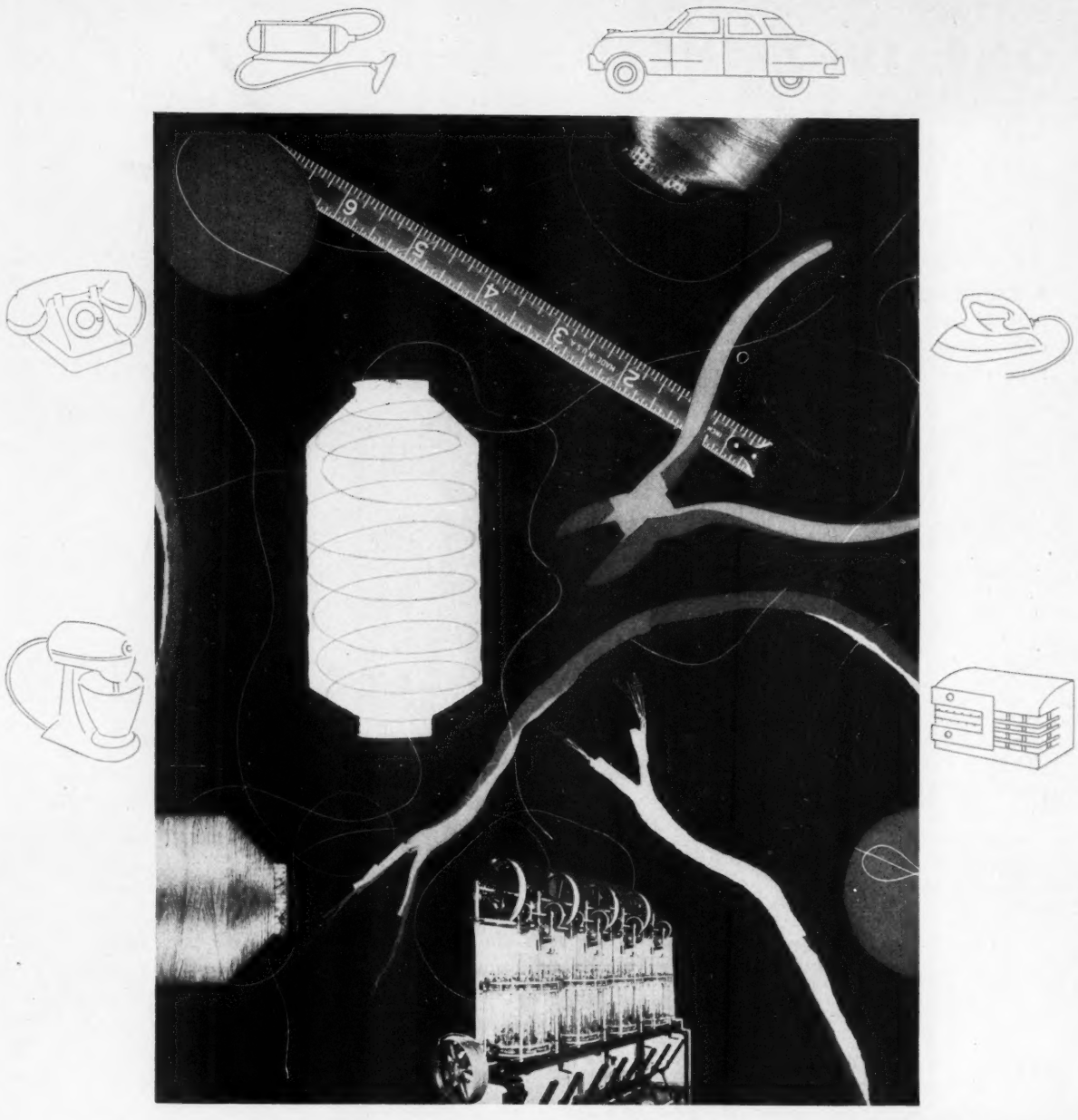
ARMCO STAINLESS STEEL WIRE



How **STRONG** should insulated yarn be?

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ONE, TWO, THREE *and now* 4

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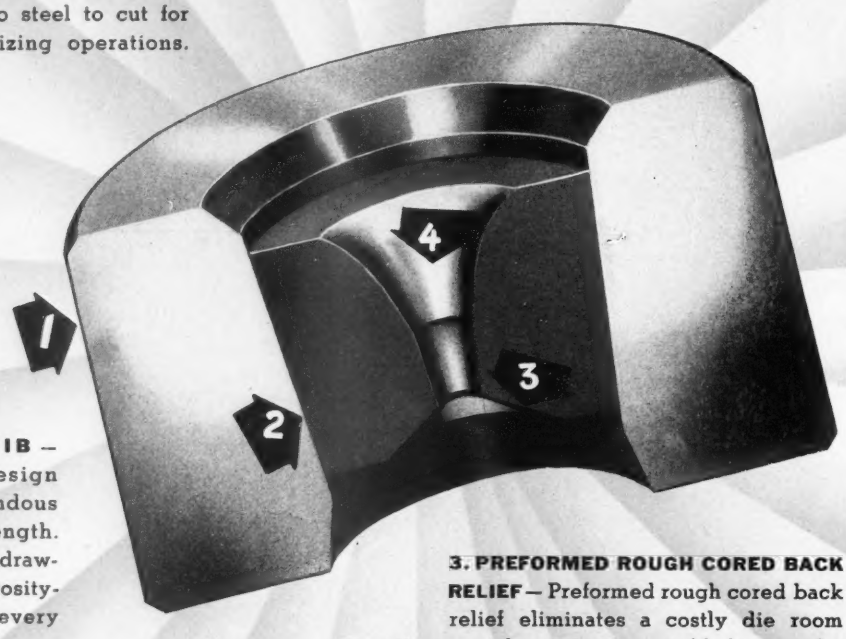

2. TAPERED NIB—Tapered nib design results in tremendous internal nib strength. Perfect concentric drawing surfaces of porosity-free carbide in every V-R die.

3. PREFORMED ROUGH CORED BACK RELIEF—Preformed rough cored back relief eliminates a costly die room operation over the entire range of hole sizes for the life of the die. With the proper back relief angle built right into the die nib, breaking and chipping due to oversight or neglect is a thing of the past.

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For many years the problem of piercing blank dies for hole sizes under .015" has been a headache to die makers — not only did this slow up production but operation was costly. Recently, Vascoloy-Ramet Corporation began a series of practical experiments to rough core a die to finish at a size below .015". Extensive tests have proved the success of this development, and today we offer you R-0, R-1, R-2 and R-3 V-R Carbide Dies rough cored at .004" and .010".

"The V-R carbide die designs originate in your shop" is not just a slogan but a rule and guide for our Engineering Department. Your needs are a constant subject of research in our plant.

Write or call today about the V-R Carbide Dies with the 4 most outstanding die developments ever incorporated in a single die!

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District Sales and Service in Principal Cities

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

The Wire Outlook

The world is forever undergoing evolution. The "good old days" are irreparably gone. Industry-wise, a new era, although it has taken no definite shape and at the moment may be even considered undesirable in many respects, is dawning.

It might be called the humanized industrial age, for in it individual will count for more than heretofore; it is quite possible that before long, in democracies, at least, the employee will be considered a partner in business enterprise and will share more fully in the profits of industry. Some few businesses are so organized now.

Before this goal can be realized widely, a revolution will have had to take place in the thinking of many employers and of most of the men who toil for a wage, to bring themselves into adjustment with the forces that inexorably are moving forward.

The man who labors for a living must acquire a sense of personal responsibility for the quality and quantity of his work before he can expect an income of better purchasing power than he enjoys today. The man who creates jobs must come to feel that labor is not a commodity, and that contribution to our general economic well-being is made by individuals who are as human as himself.

In business, interests are mutual. Labor and management must gradually evolve a degree of respect and understanding, one for the other, from which all may expect to benefit. When that time arrives, gone will be the vicious spirals of wage increases granted under duress and price increases that quickly erase such advantages.

How important good industrial relations are may be gathered from an estimate which states that steel shortages alone cost the country 15 billion dollars in lost business in 1947. $250,000,000 are said to have been paid in excessive prices by small business for steel purchased in the gray market last year. We have a capacity of 95,000,000 tons a year, but already this year 18,000,000 tons of steel are irretrievably lost through the coal strike.

Automotive shut-downs caused a decline in demand for bolts and nuts, which has since resumed, but from other quarters—farm implement, tractor, road building machinery, and stationary engine manufacture—there has been no let-up. Deliveries are definitely related to cold heading wire availability, which has not been too consistent. However, the fastener industry is doing well for itself this year—as it did in 1947.

Most merchant and manufacturers' wire products continue in great demand with the outlook good for as far as one can see. Distribution continues to be by allocation.

The demand for spring wire is heavy, but some specialties, like tire bead wire, have softened. While nail, fencing and other merchant items are being produced at record levels, stocks are at low. Music wire has become relatively easy to obtain. Bale tie and baling wire is in heavy demand, because of seasonal influence.

Lead consumption is running high, 284,159 tons having been consumed by all industry in the first quarter, 16% of which, 44,678 tons, was used by cable makers. Supplies are considered to be very short.

Aluminum production was further reduced by the floods in the Northwest in June and with the amount of aluminum that will be required for re-armament, the prospect of an abundant supply is becoming remote.

Our country can take much satisfaction in the display of unity at the Republican convention, in view of the strong probability that its candidate is very likely to be elected in November. Insofar as we have suffered from disunity, prima donna tactics and poor leadership for a decade and a half, we shall be fortunate if we can have as our chief executive a man who is practical, straight forward, cooperative and given to asking on each project: Is it good? Is it workable? From such an administration we may expect some semblance of order to be developed out of its inherited chaos.

—from the Editor's Desk

UPRIGHT ★ ★ ★

★ ★ ★ CONE

Wire Drawing Machines

FOUNDED WATERBURY FARREL 1851

THESE high speed machines are available in several sizes and can be had with either a coiling block or spooler. The spooler may be an attachment or a separate floor-type device, such as shown. This is the No. 4 machine with belt-type cradle spooler. It is driven by a direct-coupled motor (not shown), has 13 dies and capacity for drawing copper from ¼" maximum starting size down to a finishing size of from No. 10 to No. 18 B. & S. gage. The dies and the hardened steel drawing rolls are enclosed by a rolling steel curtain to confine the splash of the drawing lubricant.

WATERBURY-FARREL
FOUNDRY & MACHINE COMPANY
Waterbury, Connecticut, U. S. A.
SALES OFFICES CHICAGO CLEVELAND NEWARK, N. J.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 23 AUGUST, 1948 No. 8

Designated as
Official Publication By The Wire Association

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Publication Office: New York
Executive Office: Stamford Trust Co. Bldg., 300 Main St., Stamford, Conn.

Annual Subscription, U. S. $5.00, Canada $5.00

50 Cents a Copy in U. S. Issued Monthly Foreign, $7.50
October Convention Issue $1.00 a Copy
January Convention Discussions Issue $1.00 a Copy

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DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 23 AUGUST, 1948 No. 8

Disposal of Pickling Liquors

By Brun J. Queern, Chemical Engineer
The Dorr Company
New York, N. Y.

RESTRICTIONS on the disposal of pickling liquors into streams or municipal sewerage systems are becoming more severe since the termination of the war.

* * *

FROM the standpoint of disposal into a stream, pickle liquors containing varying concentrations of free sulphuric acid and ferrous sulphate are harmful to marine life because of the acid content and the iron salts are objectionable because they coat the bed and banks of the stream with a brown pigment resulting from the action of the air on the ferrous sulphate.

* * *

ALTHOUGH the weak wash waters might be tolerated in a municipal sewage plant when the waste water represents only a small part of the total flow, the discharge of a batch of spent liquor having a high percentage of free acid would have a serious effect on the treatment processes, particularly the digestion of the sludge. It also will increase the load of solids to be handled and create a corrosion problem. The treatment of the wastes by neutralization at the source for ultimate disposal in the municipal sewage plant is also not generally acceptable. The additional solids resulting from such treatment are difficult to dewater on sludge beds and the large proportions of undigestible solids adversely affect the digestion process.

* * *

INDUSTRY must, therefore, seek a method for the treatment of the waste which will deliver an effluent within the limits permitted by the authorities with respect to acidity, soluble salts content and suspended matter.

* * *

THE ideal method would be one which results in a product which offsets the cost of treatment and, preferably yields a dividend. Unfortunately, no methods have yet been developed to take care of the tremendous volume of pickle liquor produced daily and produce materials which can be absorbed by the markets.

* * *

COMMERCIAL developments will probably be confined to the treatment of the spent acid, leaving the weak wash waters still to be taken care of.

* * *

AMONG the methods in use or investigated for the conversion of the strong liquors to usable end products are:

1. Evaporation and crystallization of copperas. Due to the high solubility of ferrous sulphate, the final mother liquor still represents a difficult disposal problem.

2. Conversion to sulphuric acid and ferric oxide. This is a patented process which requires a large capital investment and has yet to be applied to pickle liquors from steel or wire mills.

3. Production of iron oxide pigment. This process which involves the conversion of the free acid to ferrous sulphate by scrap iron, clarification of the resulting liquor, evaporation and calcination is used by some of the pigment manufacturers but the amount of pickle liquor which can be absorbed is relatively small.

4. Treatment with ammonia to produce ammonium sulphate and iron oxide. This will probably be confined to steel plants where coke oven ammonia is available. The presence of cyanides and other toxic salts in the ammonium sulphate may be a serious factor in this process.

The author was attached to the Westport Mill, the research and testing laboratories of The Dorr Company for several years, in the capacity of Chief Chemist.

During this period, a great variety of problems pertaining to trade wastes including many on both strong liquors and wash waters from pickling operations were studied.

At present, the writer is attached to the Sales Department and contacts in the field have given him a knowledge of the problems involved from the viewpoint of the manufacturer as well as from the theoretical angle.

5. Production of insulation or building material by the Ferron Process which consists of liming to a controlled pH, filtering and extruding before drying.

* * *

IN view of the probability that commercial products can be made in but a few isolated cases and the problem of handling the weak wash waters must be considered, industry must be prepared to consider the problem of neutralizing the waste waters by the cheapest method and disposal of the resulting precipitate.

* * *

THE treatment methods might be divided into three classes:

1. The treatment of the strong liquors from small plants consisting of 2 or 3 batches of 1,000-2,000 gallons each with the weak wash waters going to the sewer or stream.

2. The continuous treatment of the strong liquors and wash waters from the above plants.

3. The continuous treatment of the wastes from larger plants.

* * *

THE treatment of batches of strong liquor only, is the simplest problem facing the industry. The plant required does not involve a major expenditure and the floor space required is not very great. In addition, the labor involved is a matter of a few hours per batch. Close control is not required because the free acid will at all times be neutralized and the bulk of the iron salts will be precipitated.

* * *

THE steps in the procedure are the dumping of a batch of spent liquor into a tank equipped with an agitator, diluting with three volumes of fresh water or weak wash water, the addition of hydrated or quicklime to the desired pH, agitation for a period of about one hour and pumping the resulting pulp to a lagoon or similar disposal area.

* * *

DILUTION of the strong liquor is necessary to provide sufficient fluidity to the pulp following the addition of the lime required for complete neutralization. Without the dilution water, a plastic mass would result in which the lime could not be incorporated and the pulp could not be removed from the tank.

* * *

THE lime can be added to the dilution water before adding the pickle liquor, thereby eliminating the free acid and its attendant corrosive action.

* * *

AN excellent method for the continuous treatment of the weak solutions with the incorporation of the strong liquors is in use at the **Gilbert and Bennett** plant at Georgetown, Connecticut.

* * *

THE treatment plant was originally designed to handle about 6,000 gallons per hour of wash water containing about 900 ppm of total iron and 50 ppm of free sulphuric acid. The strong batches of spent liquor were evaporated and crystallized to produce copperas for the trade. In recent year this was abandoned and the strong liquors are now treated along with the weak liquors.

* * *

THE plant consists of a holding tank of adequate capacity to allow for stabilization of the flow and solubles content. Periodic analysis of the lime requirements are made by titrating a sample of the liquor with a standard caustic solution and adjustments of the lime are made to give the desired pH.

* * *

AFTER the addition of the lime, the pulp is agitated in a 10′ x 10′ tank equipped with an impeller agitator to insure complete utilization of the lime. From the agitator it flows continuously to a 30′ dia. x 9′ center depth **Dorr** Clarifier where the suspended solids settle. The Clarifier produces a clear effluent and a thick sludge consisting of ferrous-ferric hydroxide and gypsum is raked to the discharge cone. The Agitator and Clarifier are shown in the accompanying photograph (Fig. 1). The thickened sludge is withdrawn from the underflow line of the Dorr Clarifier periodically by gravity to a lagoon. Solar evaporation and ground seepage eventually produce a fairly firm mud.

* * *

WHEN the production of copperas was abandoned, the treatment of the strong batches necessitated a change in the controls and technique. The inclusion of the volume of strong liquor required dilution to reduce the concentration for reasons mentioned before. It is, therefore, necessary to have sufficient volume available in the holding tank so that the batch can be dumped quickly and then diluted with weak wash to a satisfactory concentration. The lime addition is then controlled to

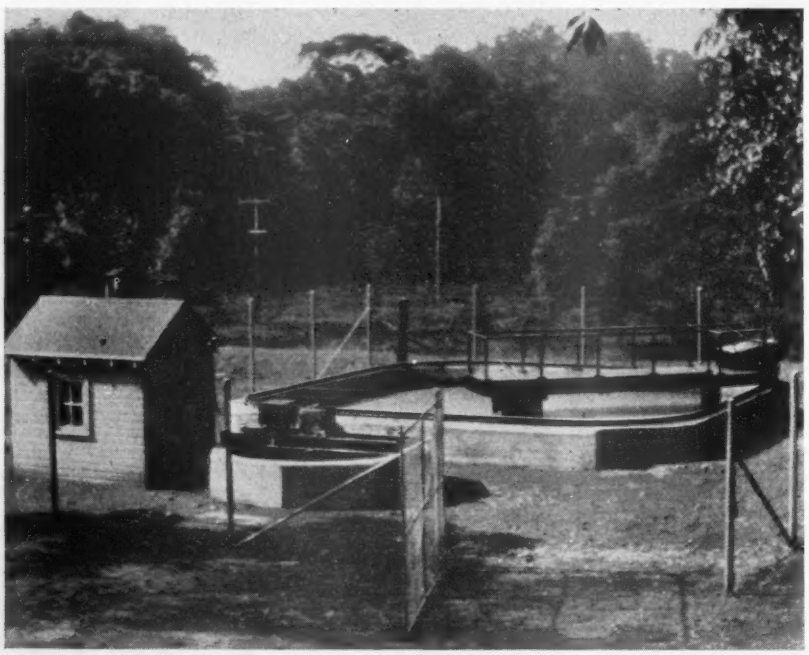

Fig. 1. — Plant for treating waste pickle liquor, at Gilbert & Bennett Co., Georgetown, Conn.

take care of the increased concentration and the neutralized pulp is delivered to the clarifier.

* * *

AT times, the volume available in the holding tank is insufficient for dilution when a tank must be dumped and the strong solution is by-passed to the lagoon where the excess of lime present in the mud is sufficient to neutralize the free acid and iron.

* * *

THIS plant is well operated and the results obtained meet with the approval of the Connecticut State Board of Health.

* * *

IT is estimated that the reagent consumption amounts to about twenty-five cents per 1,000 gallons of weak wash water. In a new project of a similar nature, the control and necessary supervision can be simplified by providing a holding tank for the strong liquor with means for distributing the quantity over a reasonable period of time.

* * *

FOR the larger plants, the handling of hydrated lime, its cost and the disposal of the gelatinous ferrous hydroxide-gypsum sludge with its high moisture content become important factors, and it was recognized some years ago that a search for a better method was warranted. Finely ground high calcium limestone combined with air to oxidize the ferrous salts to the ferric state was found to be a better reagent from the standpoint of cost and handling. The resulting complex ferric oxide-gypsum residue has the dewatering properties of a crystalline instead of a slimey product which makes the ultimate disposal problem much simpler. A suggested flowsheet is shown in the sketch. (Fig. 2)

* * *

CRUSHED limestone, ½ inch or finer is stored in a bin of 50 tons or more capacity, equipped with a control for feeding the ball mill at a uniform rate. The grinding is done by the wet method by the standard closed circuit grinding system. The pulp discharging from the mill enters a Classifier of a size which will allow the material ground to a satisfactory fineness (about 200 mesh) to overflow the weir while the oversize material settles and is raked up the inclined deck to be returned to the ball mill along with the new feed. The ground limestone containing an excess of water is delivered to a Thickener where the solids are concentrated and removed at a uniform rate to a storage tank equipped with an Agitator. The overflow from the Thickener may be returned to the grinding circuit. The preparation of the limestone can be confined to an 8 hour period if desirable by the use of larger equipment in the stages preceding the storage tank.

* * *

IF the strong pickle liquor is discharged intermittently, a storage tank with a proportioning pump should be installed to control the rate of addition to weak wash waters. This is essential for simpler control of the rate of addition of the limestone and the savings in cost of reagents will soon repay for the cost of this unit.

* * *

THE combined strong and weak liquor blend then flows to a series of three agitators, each equipped with aerators which may be of the porous tile type or impellers which disperse air in a finely divided state necessary for a high efficiency. If porous tile is used, auxiliary agitation will be required to keep the gypsum crystals in suspension. No reliable data are available on the efficiency of the utilization of the air or the quantity required. It is estimated that about 30 percent efficiency might be as high as can be expected.

A SUGGESTED TREATMENT OF WASTE PICKLE LIQUOR

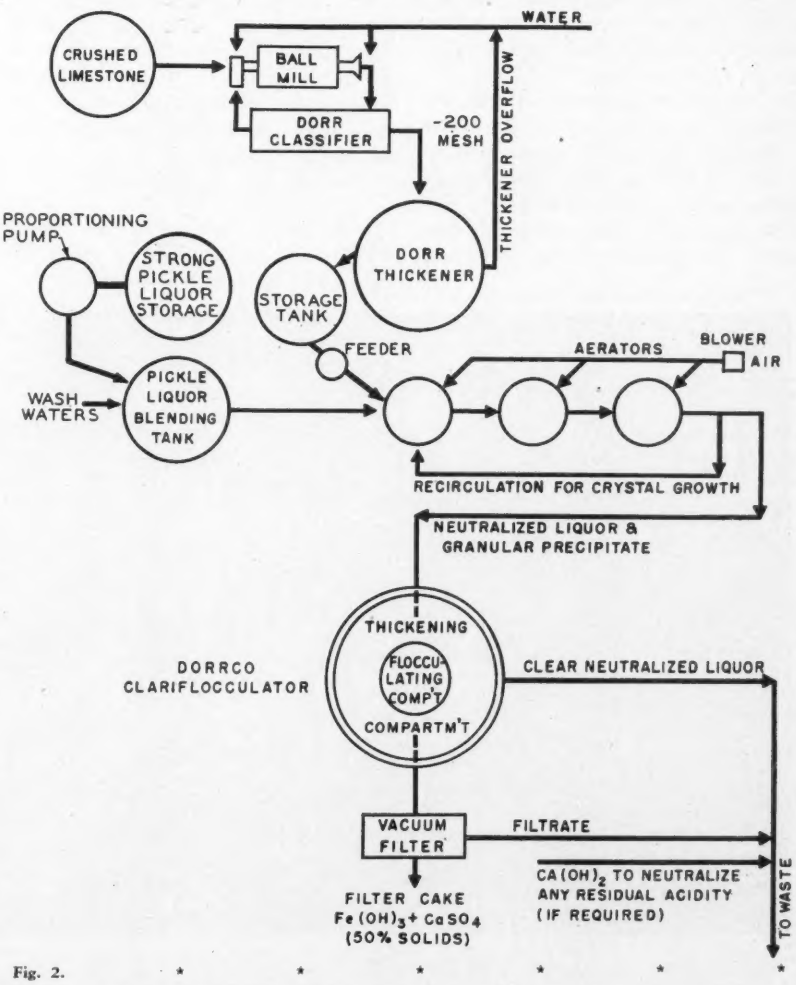

Fig. 2.

A contact time of about six hours based on the original liquor flow is estimated for the neutralization-ozidation step. To increase the gypsum particle size and thereby improve the dewatering properties, a portion of the discharge from the third agitator is returned to the first agitator to provide nuclei. Tests in the laboratory indicate that this circulating load might be as high as 300 percent of the original volume. This increases the sizes of the aeration tanks but the marked improvement in the quality of the precipitated solids appears to warrant the recirculation step.

* * *

THE neutralized liquor and granular precipitate flows to a **Dorr Clariflocculator** which is shown in the sketch. (Fig. 3). This is a dual purpose unit in which the finely divided particles are agglomerated by the addition of a small amount of flocculating reagent such as causticized starch and gentle mixing at a controlled rate in the Flocculator compartment. From the flocculating compartment the flow discharges through a large opening in the bottom to the Clarification section where the solids settle out to be compacted and carried to the center discharge cone for removal at a constant rate by means of a displacement pump. The clarified water overflows the peripheral launder for ultimate disposal.

* * *

THE sludge discharged from the Clariflocculator at about 33% solids can be pumped to a lagoon where further dewatering will be accomplished by ground seepage or evaporation. If the disposal area is a considerable distance away, necessitating haulage, it may be more economical to further dewater the sludge to about 50% solids on a continuous vacuum filter. At this solids content, the relatively firm filter cake can be handled in a truck.

* * *

A pH of about 5.0 is the highest which can be obtained with limestone without using a large excess of reagent and an excessively long contact time. If this is not permissible for disposal, a small amount of hydrated lime will raise the pH to between 6 and 7 without causing the precipitation of an appreciable quantity of iron from the solution.

* * *

A considerable part of the investment and operating costs for this method is in the preparation of the limestone and some thought has been given to a substitute. It was recognized that the character of the precipitate produced when using limestone was excellent for dewatering and these qualities must not be sacrificed. Some tests made substituting ground pebble lime indicated that if the lime was ground to minus 48 mesh and added directly to the pickle liquor so that the slaking and precipitation was carried on simultaneously along with oxidation by aeration, a comparable precipitate can be obtained. It is believed that the lime is coated with a film of iron hydroxide and as the ferrous sulphate is converted to the ferric salt and free sulphuric acid by the oxidation, the residual lime is reacted upon to form gypsum by penetration thereby retaining the particle size structure.

* * *

PULVERIZED, unslaked lime is available for this method of treatment but the handling of large quantities of this material must be given careful study since hydration will affect the character of the precipitate. If pebble lime is used, the preparation of minus 48 mesh unslaked lime must be done in the dry state by means of dry

(*Please turn to page* 721)

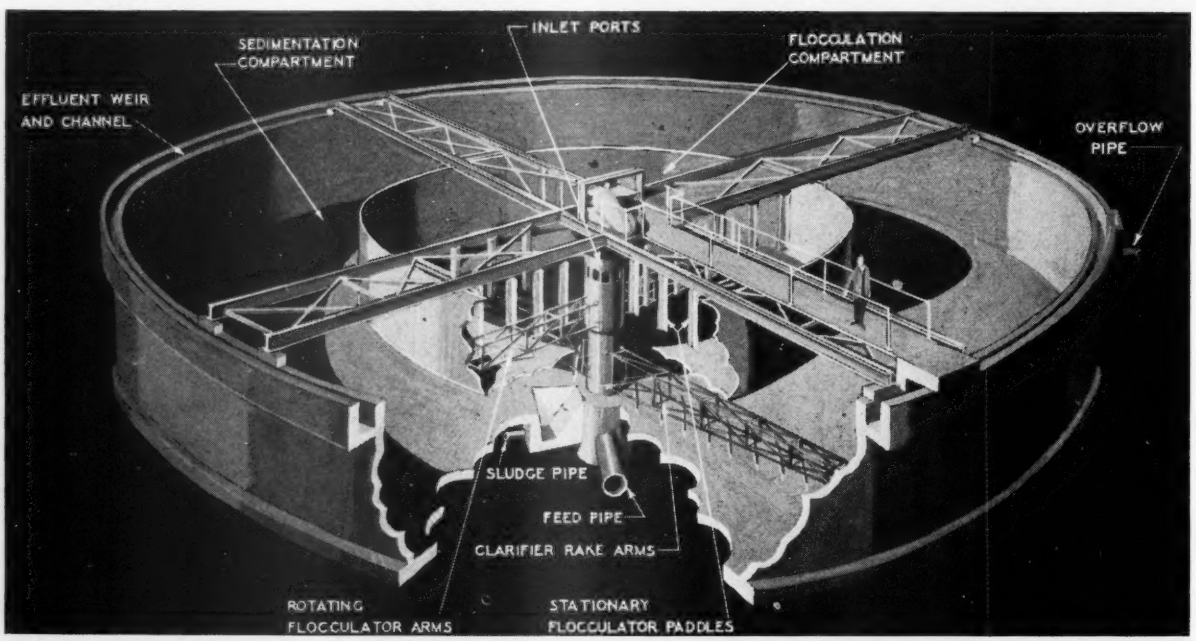

Fig. 3. — Dorrco Clariflocculator — Phantom View.

TENTATIVE PROGRAM

The Wire Association Annual Convention

William Penn Hotel, Pittsburgh, Pa. — October 18-22, 1948

(This Tentative Program is Subject to Change Prior to the Convention)

MONDAY, OCTOBER 18

Morning Events
Registration

Directors' Meeting — 10:30 A.M.

Program Committee
Meeting and Lunch — 12:30 P.M.

* * *

Afternoon Session — 2:00 P.M.

"Practical Development of Modern Wire Drawing Compounds".
by E. L. H. Bastian, Staff Engineer
Shell Oil Company
New York, N. Y.

* * *

"Fumes and Ventilation in the Wire Mill"
by Wallace G. Imhoff, President
The Wallace G. Imhoff Company
Los Angeles, Cal.

TUESDAY, OCTOBER 19

Morning Session — 10:00 A.M.

"The Control & Production of High Carbon Wire"
by Jerry G. Weiss, Supt., Patent and High Carbon Wire Dept.
Keystone Steel & Wire Company
Peoria, Illinois

* * *

"Inhibitors"
by Carl A. Zapffe, Metallurgist
Baltimore, Md.

* * *

Afternoon Session

Visit Steel Plant in
Pittsburgh Area.

WEDNESDAY, OCTOBER 20

Morning Session — 10:00 A.M.

Paper by Mr. Reginald S. Brown, Chief Met.
Rylands Bros., Ltd.
Warrington, England
With discussion by
Mr. Geoffrey K. Rylands

* * *

"Wire Drawing Research in the British Iron & Steel Research Association"
by W. Hessenberg, Head of Mechanical Working Division
British Iron & Steel Research Association
London, W.I., England.

* * *

Afternoon Session — 1:00 P.M.

Wire Association Luncheon
The Mordica Memorial Lecture to be presented by
C. L. McGowan, Supt., Rod and Wire Mill
Atlantic Steel Co.
Atlanta, Georgia

* * *

4:30 P.M.
Wire Association Annual Meeting

* * *

7:30 P.M.
Annual Dinner Stag Smoker

THURSDAY, OCTOBER 21

Morning Session — 10:00 A.M.

"Rope Wire"
by John Corson, Research Engineer
John A. Roebling's Sons Co.
Trenton, New Jersey

* * *

"Quality, Quantity & Service"
by N. T. Nelson, Jr.
Rod & Wire Mills
Bethlehem Steel Company
Sparrows Point, Md.

THURSDAY, OCTOBER 21

Afternoon
Plant Visit to
Westinghouse Electric Company
East Pittsburgh, Pa.

FRIDAY, OCTOBER 22

Morning Session — 10:00 A.M.

Two Non-Ferrous Papers

"Hot Dip Aluminum — Temperatures and Methods of Application"
by Clarence Ulschaffer, Metallurgist
Hughesville Machine & Tool Co.
Hughesville, Pa.

* * *

"The Processing of Brass Wire"
by Chris Witterald
Bridgeport Brass Company
Bridgeport, Conn.

* * *

Afernoon Session — 2:00 P.M.

"New Materials for Wire and Cable Applications"
by H. L. Wuerth, Geon Division
B. F. Goodrich Chemical Co.
Cleveland, Ohio

* * *

"A Method For Measuring Lubricant Effectiveness in Non-Ferrous Wire Drawing"
by C. B. Shopmyer, Apparatus Dept.
General Electric Co.
Schenectady, N. Y.

All papers received by September 1st., will be preprinted in the October 1948 issue of Wire and Wire Products. Papers received later will be published in the November and December issues.

The discussions and Mordica Memorial Lecture will be published in the January 1949 issue of Wire and Wire Products.

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THE WIRE ASSOCIATION, 300 MAIN STREET, STAMFORD, CONN.

Aluminum Coating of Steel Products

By Dr. Armand Di Giulio, Cons. Chemical and Metallurgical Engr.

Upton Furnace Div.
Upton Electric Furnace Co.
Detroit, Michigan

A Paper Presented at the Worcester Regional Meeting of the Wire Association on April 30th, 1948.

Introduction

FOR many years, metallurgists and engineers have devoted a considerable amount of money and talent to the utilization of the inherent properties of aluminum and some of its alloys in the form of a protective coating for iron and steel.

* * *

IT is not hard to see why the search has appealed to the investigators, both in this country and abroad, when one considers the physical properties of an aluminum coating as well as its low cost.

* * *

Discussion

PURE aluminum and many of its alloys are noted for light weight, resistance to corrosion, and pleasing appearance. Inherently they are resistant to corrosion because their product of oxidation forms a very adhering and impervious film on the metal surface. This is due to the fact that the oxide film occupies a greater volume than the metal, stops further diffusion of the oxidizing agent, and very effectively prevents further oxidation from taking place. The oxide films have been investigated and found to be of the order of magnitude .000001 cm. (1)

* * *

IT can be generally stated that corrosion resistance of aluminum and its alloys is good in media such as water, ordinary atmosphere, concentrated nitric acids, etc., but rather poor in highly alkaline and some strong acid solutions in which the oxide is soluble.

* * *

OF further interest in industrial applications of aluminum coated steel products is their resistance to oxidation at high temperature. These properties were recognized many years ago and utilized in the various methods of "calorizing" by which the alloying of aluminum with iron was carried out in special equipment and in the presence of protective atmospheres. The high temperature properties possessed by aluminum-iron alloys present us with the opportunity of extending the usefulness of many steel products, thereby making use of low cost steels in fields of application where now more expensive alloys must be used.

* * *

TABLE I gives some of the comparative properties of the various metals now used to protect steel products from oxidation. From the standpoint of weight, material cost and supply, aluminum is definitely the desirable metal to use.

THE process of which I am about to talk is relatively new and only limited experimental data can be furnished. However, the performance of aluminum products in use is certainly a very reliable base from which we may predict the behavior of aluminum coated parts.

* * *

THE literature definitely established the fact that the rate of corrosion of aluminum and its alloys is determined by the humidity and nature of impurities present in the atmosphere. In rural areas the metal is unaffected; along the sea coast some corrosion will take place with a tendency for this corrosion to be of the "pitting type" and possibly "self stopping". Even in these extreme conditions, actual records show that the rate of corrosion is very slow; for instance, aluminum transmission lines installed in 1905 in the Gulf of Mexico and in 1911 in salt water in California were found to be unaffected when examined in 1930. (2)

* * *

IN the industrial atmosphere, actual data obtained in London show that wire .126 inches in diameter corroded at a rate of .4 milligrams

TABLE I

Properties of Metals Used for Coatings

Metal	Melting Point °F.	Density at 68°F. g/cm.³	Density at 68°F. lbs/in.³	Lbs/sq. ft. .001" Thickness	Price $/lbs.
Aluminum	1214	2.70	.0975	.01404	.175
Cadmium	609	8.65	.3125	.045	1.75
Lead	621	11.34	.409	.0588	.175
Tin	449	7.30	.264	.0380	.94
Zinc	787	7.14	.258	.0371	.13

per square decimeter per day for 23 years with no change in elastic limit of the material. (3) In industrial atmospheres containing sulphur products, aluminum and its alloys are hardly affected and aluminum products are frequently used in presence of hot sulphur bearing gases in oil refineries.

* * *

Application of Aluminum Iron Alloys for High Temperature Surface

AS I have already mentioned, the high temperature oxidation resistance of aluminum iron alloys has been known and utilized for many years. These properties depend on aluminum-iron alloy containing approximately 25% aluminum and of varying thicknesses depending on nature of application, generally from .025 to .04 inches. The alloy-coatings are produced by prolonged heating at temperatures ranging from 1500°F.-1800°F., but this application is limited because of cost. More recently, and specifically for sheets and wires, a dipping process has been developed which requires careful maintenance of hydrogen atmosphere from the time the steel leaves the pickling solution to the time it is immersed in molten aluminum. This process is inherently costly both from the standpoint of original investment as well as operation.

* * *

Coating with Upton Salt Bath Furnace

THE method developed by the **Upton Furnace Division** makes use of the Upton Electric Resistance Furnace for melting of the flux and for the melting of the aluminum.

* * *

AS it is well known, the Upton Salt Bath Furnace is the only salt bath furnace in which the electrodes are completely submerged beneath the salt. This makes possible the melting of the aluminum or its alloy above the salt, thus achieving the following advantages:

1) a rapid melting rate,
2) no contamination with metallic surfaces,
3) long electrode life,
4) uniformity of temperature.

TO these specific advantages one must add the low maintenance cost, the high efficiency of resistant salt bath furnaces and the small floor space requirement for the equipment.

* * *

THE method makes use of two furnaces and the operations are carried out as follows:

1) degrease steel in solvent degreaser,
2) immerse in pickling solution,
3) rinse and dry,
4) immerse in molten flux of Furnace No. 1 for a few seconds,
5) transfer immediately to Furnace No. 2 containing the molten metal.

* * *

IN common with all processes for applying metallic coatings to steel products, steps No. 1 and 2 are necessary to make the surface of the steel free from dirt and grease. The cleaning medium of step No. 1 should be specified in relation to the type and amount of foreign matter on the surface of the steel. The pickling operation must be carefully carried out, possibly with a solution containing inhibitors, and the time and temperatures of pickling closely controlled to prevent over-pickling and pitting of the surface. Rinsing with cold water, followed by hot water at a sufficiently high temperature so that the piece is self-drying, is suggested.

* * *

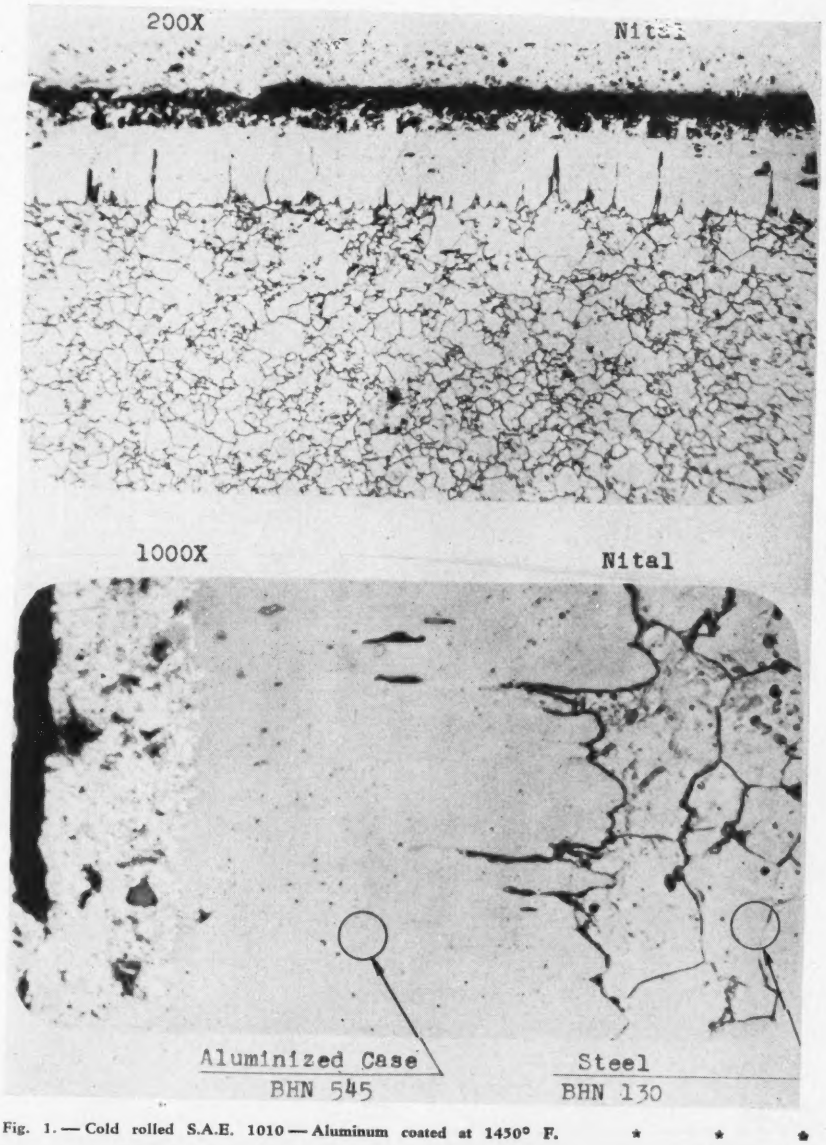


Fig. 1. — Cold rolled S.A.E. 1010 — Aluminum coated at 1450° F. * * *

TABLE II

The Effect of Time and Temperature on the Thickness of Aluminum Layer. (Swedish L. C. Steel Wire)

Time of Dipping Seconds	Al in.	Al_3 Fe in.
	Temperature 1328° Fahrenheit	
1	0.0012	0.00031
2	0.0012	0.00035
5	0.0016	0.00043
10	0.0012	0.0008
30	0.0012	0.0012
	Temperature 1508° Fahrenheit	
10	0.0008	0.0031
20	0.0008	0.0035
60	0.0012	0.0039
120	0.0016	0.0059

Data courtesy of Linden and Company.

GRAPH NO. I

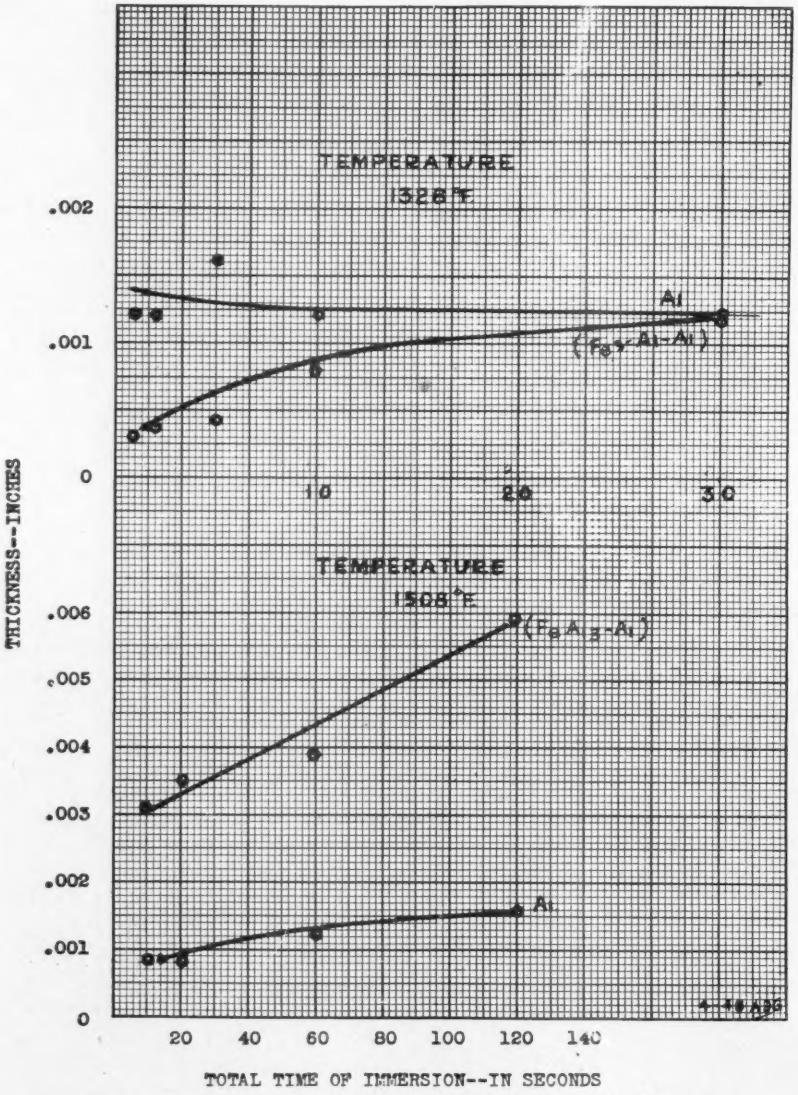


Fig. 1A.— * * * * *

THE material thus cleaned and dried is then immersed in Furnace No. 1, in which molten flux is maintained at a temperature of about 750°F. This step not only fluxes the surface of the metal but also preheats the part. The time of this immersion is relatively short: generally only a few seconds. The part is withdrawn, allowed to drain and then immersed in Furnace No. 2. In this furnace, molten aluminum or its alloy is floating on top of molten salt and covered with a film of fluxing material which very effectively prevents oxidation of the metal.

* * *

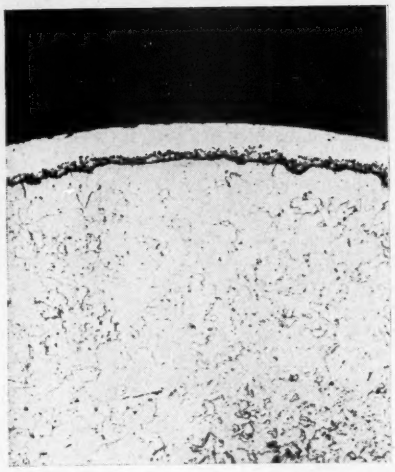
IN this process it can be seen that the use of the Upton Furnace eliminates the contact between molten aluminum and pot or electrode materials, thus contamination is prevented. Those who have experience in melting aluminum in the ordinary steel pots will readily appreciate the value of this feature. It is also important to note that, because of the construction of the Upton Furnace, it is relatively easy to mechanize the process, since the conveying mechanism can be laid on top of the furnace without interfering with any of its integral parts.

* * *

AT this point, it is of interest to note that in Sweden a method of coating aluminum has been developed which recognizes the value of the molten salt bath, but, because the electrodes immersed from the top are insulated by means of ceramic material, the size of the furnace is very limited and the expensive replacement of insulators and electrodes materially adds to the cost of the process.

* * *

WHILE the method of melting aluminum in induction furnaces is applicable for relatively small furnaces, one must consider the higher operating cost due to the lower conversion efficiency of the machine, the higher maintenance cost and the larger floor area requirement for the same melting capacity, together with the fact that the control of temperature of the molten aluminum in electrical resistance furnaces is easily accomplished.



Etched X100
Fig. 2. — Low carbon 1/8" D. Wire — Wiped after immersion. * * *

The Structure of Aluminum Coated Steel

THE hot dipping process just described has been used successfully for a very large variety of articles such as stampings, welded tubes, bolts, nuts, wires, pole hardware, etc. Many of these parts are undergoing tests and several industrial concerns are in the engineering phase of adapting the method to their particular problems.

* * *

IT is important at this time to present some of the data obtained which show structure and properties of this coating.

* * *

THE process depends on the fact that iron and aluminum will alloy very readily beginning at temperatures near the melting point of aluminum. In all the coatings which have been investigated so far, we have obtained the typical structure illustrated in Photomicrograph No. 1 which shows the outer layer of the coating, consisting of relatively pure aluminum, and the inner layer made up of aluminum and the compound FeA13 corresponding roughly to about 41% iron and 59% aluminum. The extent of these two layers depends on the temperature and time of immersion. Generally speaking, it can be stated that:

1) **the lower the temperature of immersion, the thicker is the pure aluminum portion of the coating,**
2) **the longer the time of immersion at any temperature, the thicker is the alloy portion of the layer,**
3) **for temperatures up to 1750°F. the layer possesses the typical color of aluminum,**
4) **above 1750°F. and depending on time of immersion, the color will gradually change from light gray to dark gray,**
5) **around 2000°F. the deposit is almost black,**
6) **the hardness of alloy layer, regardless of the temperature of immersion, varies between 500 and 650 Micro Vickers Brinell Hardness.**

* * *

TABLE No. 2 and Graph No. 1 show the actual measurements of the two portions of the layer obtained on samples of steel wire reported here by courtesy of Linden and Company. The data shows that:

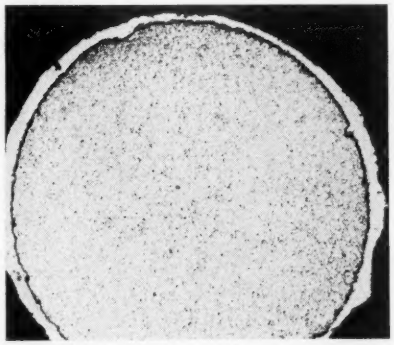
1) **at low temperature the thickness of the pure aluminum portion is independent of time, while the iron aluminum alloy portion varies directly with time,**
2) **at higher temperature, while the aluminum portion increases slightly with time, the Fe-A3 alloy layer increases very rapidly with longer time of immersion.**

* * *

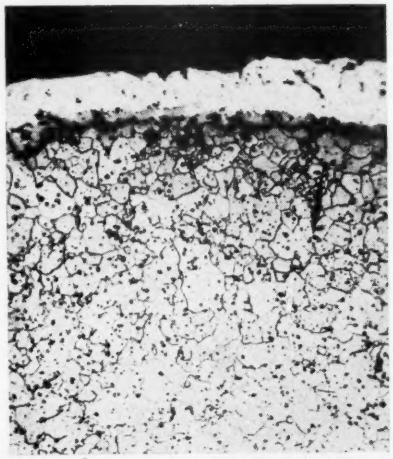
PHOTOMICROGRAPH #2 shows 1/8 inch steel wire, aluminum coated, and again it illustrates the two layers together with the very good bond obtained in what apparently was a longitudinal scratch in the wire. This point is again illustrated in Photomicrograph No. 3 of a 1/16 inch wire which was not wiped after dipping. It will be noticed that the aluminum coating has penetrated the imperfection of the wire surface.

* * *

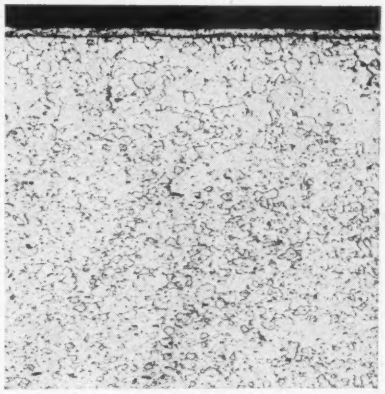
PHOTOMICROGRAPH #4 shows the structure of commercial low carbon sheet steel as coated. As before, the two portions of the coating are very evident.



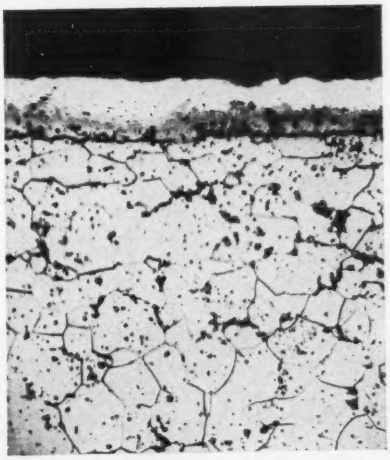
Etched X100
Fig. 3A. * * * * *



Etched X500
Fig. 3B. — 1/16" D. wire produced by pulling through furnaces and not wiped. — Temp. 1300°F. * * * *



Etched X100
Fig. 4A. * * * * * *

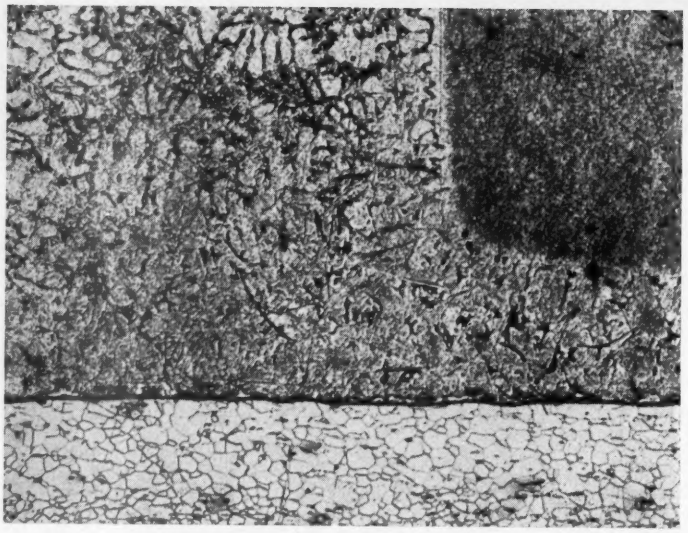


Etched X500
Fig. 4B. — Low carbon steel aluminum coated at 1400° F. * * * *

THE experimental work thus far has not been limited to low carbon steel but equally good results have been obtained with steels up to .85% carbon, and on lower carbon steels which had been case hardened. Photomicrograph No. 5 shows the structure of a medium carbon steel plow share which was aluminized at 1350°F. with a total immersion time of two minutes.

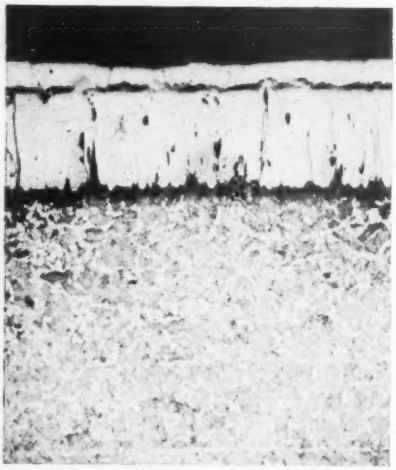
* * *

OF interest to fabricators is the fact that an aluminum coated steel part can be dipped or torch brazed to an aluminum part by existing methods. This is illustrated in Photomicrograph No. 6 which shows the bond obtained between commercial aluminum tube and aluminum coated SAE 1010 welded



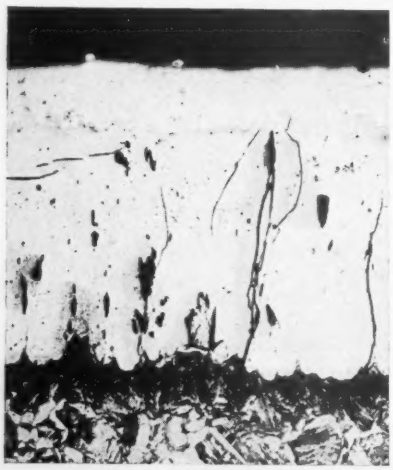
Etched X100

Fig. 6. — Structure of the Torch brazed joint between commercial aluminum tube and aluminum coated L. C. steel. * * *



Etched with Keller's Sol. X100

Fig. 5A. * * * * * *



Etched with Keller's Sol. X250

Fig. 5.B. — Case hardened steel aluminum coated at 1350° F. * * * *

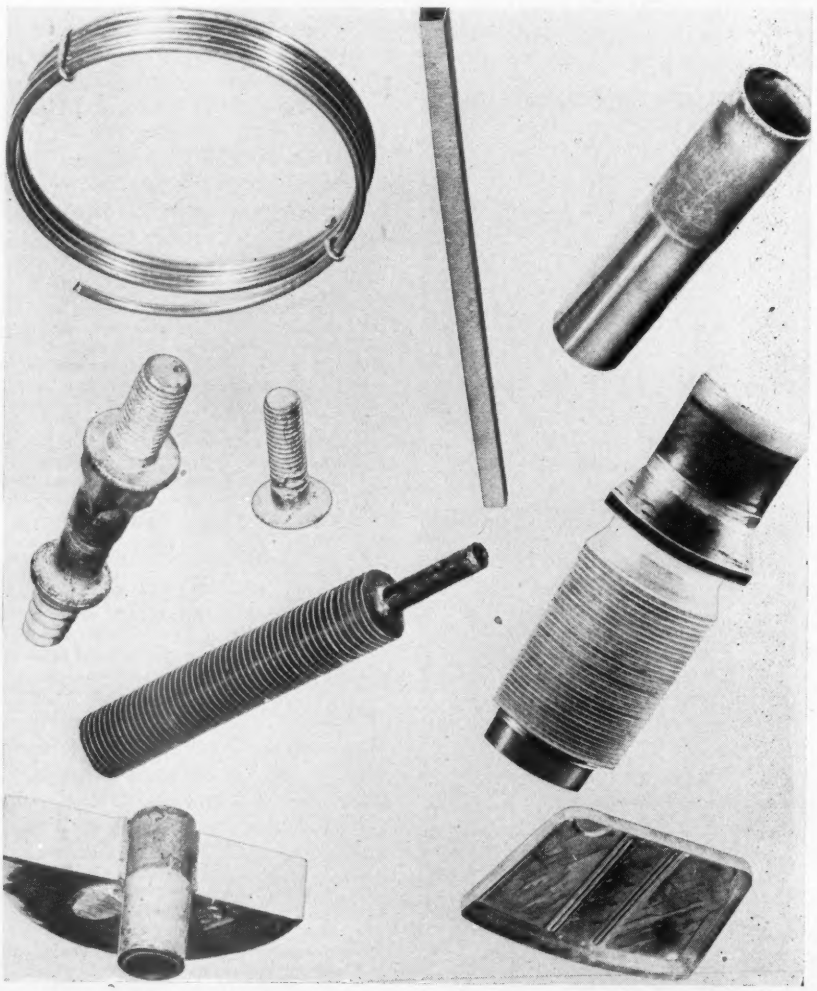


Fig. 7. — Miscellaneous pieces, aluminum coated. — Note aluminum casting around steel tube and aluminum fins brazed to aluminum coated steel. * * * * * *

tube. Another application of the coating of steel is to be found in the fact that aluminum can be cast directly on an aluminum coated piece of steel and the bond is very strong, as illustrated in Photograph No. 7 which shows, among the many coated pieces, a welded tube around which aluminum alloy was cast. The tube could not be removed or pushed out until after considerable cutting and breaking.

* * *

AS I mentioned before, large possibilities of application exist in the field of high temperature oxidation, that is to say, to temperatures as high as 1750°F. Preliminary experimental tests have been carried out and Photographs No. 8A and 8B show the results obtained thus far.

PHOTOGRAPH No. 8A shows appearance of aluminum coated steel, together with same steel without coating, exposed for 168 hours in an electrically heated resistance furnace, heated to 1700°F.-1900°F. The uncoated steel is completely oxidized, while the aluminum coated samples are barely discolored. Photograph No. 8B shows the appearance of aluminum coated steel samples exposed for 1200 hours to the direct impingement of intermittent household type of gas burner; the aluminum coated steel is still bright, while the uncoated piece is covered with red iron oxide.

* * *

Conclusion

THE author realizes that the material here presented is not exhaustive. A considerable amount of experimental work is in progress and it is hoped that it will be presented at a later date.

* * *

I take this opportunity to thank Linden and Company for the use of the data of Table No. 2 and the Upton Furnace Division for permission to present this material.

* * *

References

(1) Vernon, W. H. J. "Second Experimental Report to the Atmospheric Corrosion Res. Committee, Trans. Faraday Soc. (1927) 113–183.

(2) Edwards, J. D. Frary, F. C. and Jeffries, 2. "The Aluminum Industry", McGraw-Hill Book Co., Inc. 1930.

(3) Wilson, E. "The Corrosion Products and Mechanical Properties, etc.", Proc. Phys. Society London 39 (1926) 15–23.

PHOTOGRAPH 8A

UPTON
After Exposure for 168 Hours in
Muffle Furnace @ 1700-1900°F.
Photograph 8B
UPTON
Exposed for 1200 Hours directly in Flame of Natural Gas Burner

Fig. 8. * * * * *

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Drives for Automatic Speed and Tension Control in Wire Processing Equipment

Part I

By N. J. Ranney, Chief Engineer
Wean Equipment Corp.
Cleveland, Ohio

This article is divided in three parts, electrical, mechanical and hydraulic drives, and the article will be published in two parts. The first part relates to electrical drives and the second part to the mechanical and hydraulic drives.

Introduction

ONE of the outstanding trends to be observed in modern wire processing equipment is that of performing two or more operations simultaneously on the same strand of wire. Where this is done, some means of controlling the speed or tension, or both, is usually required.

* * *

AN excellent example of the need for such control lies in the multiple stand tandem wire flattening mill. Here a single strand of wire passes through several mill stands at the same time, the wire being elongated with each successive pass, and accurate speed control of the rolling mills is essential. Another example lies in the many cases where a strand of wire is processed and spooled in one operation, such as, for example, drawing a strand of wire through a heat treating furnace with a capstan and winding it on a spool. Here it is necessary to slow down the spooler as the coil builds up, maintaining approximately controlled tension between the spooler and the capstan drum.

* * *

SPEED and tension control are closely related. If a strand of wire is being coiled under constant tension, the speed of the coiler is controlled to maintain that tension.

* * *

IN the case of speed control, an indicator or signal device which can measure the speed is frequently used to actuate the controlling medium. This indicator may consist of a contact roll which rotates at the same speed as the wire, or of a dancer roll which rides in a loop of the wire. In the latter case, tension control can frequently be achieved at the same time by using a weighted dancer roll.

* * *

IN the case of pure tension control, the drive is usually arranged to produce constant tension without an external indicator.

* * *

THE control of speed or tension is inherently a part of the drive itself. In recent years, numerous drive arrangements for obtaining accurate speed and tension control have been developed. These include electrically controlled drives (including electronic), mechanically controlled drives, and hydraulic drives. The following examples will illustrate various means of obtaining speed and tension control in connection with these three types of drives.

* * *

PART I — ELECTRICAL DRIVES

Rotating Regulator

A remarkable and rather recent development for use in speed and tension control in the electrical field is the device known as a rotating regulator and amplifier. This device, which resembles a small D-C generator in appearance, goes by the various trade names of Amplidyne (General Electric), Rototrol (Westinghouse), VSA Regulator (Reliance Electric & Engineering), and Regulex (Allis Chalmers). It has great sensitivity, and a small variation in electrical signal produces a highly amplified corrective action. This unit has a multitude of applications, among which are the regulation of voltage and current, controlling the speed of D-C units, and maintaining constant tension.

* * *

Wire Flattening Mill Application Electrical Control

AN interesting example of the use of this device is found in the control of the five-stand eight-inch tandem wire flattening mill shown in Figure 1. In this application, round wire ranging from .0915 inches to .192 inches in diameter is pulled from an unwinding reel and passes successively through five motor driven mill stands, after which the flattened wire is traverse wound on a tension reel. Due to the fact that the mill flattens high carbon spring wire of fairly large diameter, it was felt desirable to adopt a scheme of control which would not require loops between the mill stands or between the last stand and the reel. Also it was desired that the mill have a variable speed range of from 200 to 600 f.p.m., and that provision be made for compensating for the elongation of the wire in each pass and for slowing down the reel due to the build up of the coil of from 6 inches diameter to 16 inches diameter.

* * *

THE electrical equipment for this installation was furnished by the Reliance Electric & Engineering Company, and the schematic control diagram is shown in Figure 2. Each of the five mills is powered by a 20 HP, 1150/1725 r.p.m., D-C motor, and the reel by a 5 HP, 400/1600 r.p.m., D-C motor. All of the mill motors are powered from a common D-C generator, utilizing what is known as variable voltage

or "Ward-Leonard" control. With this set-up, the speed of all the mill motors can be varied simultaneously by varying the voltage supplied by the generator. This is done through special electronic control regulating the generator field. For example, at 230 volts the mills can be set to run at 600 f.p.m. If the voltage is then reduced to 115 volts, the speed will reduce to 300 f.p.m.

* * *

THE speed range of from 1150 to 1725 r.p.m. by field control on each of the mill motors is adequate to compensate for elongation of the wire due to flattening, and for establishing tension between the mill stands. A manually adjusted rheostat is connected in each of the five mill motor fields, and an ammeter is provided for each mill motor. In threading the line, the rheostats are adjusted until the ammeter on each newly threaded mill stand motor starts to increase above the value imposed by rolling load, thus indicating that tension has been established between the newly threaded stand and the preceding stand. The five mill motors are built with matched load-speed characteristics. In addition, a 10 per cent speed drop is built into the motors so that the motors will tend to slow down as the load increases, and thus prevent building up excessive tension between stands.

* * *

THE 5 HP reel motor receives its power from a separate generator included in the main M-G set. The No. 5 mill stand motor drives a tachometer generator, the output of which excites the main field of the reel generator. In this way the voltage supplied by the reel generator varies in proportion to the mill speed, and thus regulates the speed of the reel motor corresponding to the mill speed.

* * *

A VSA rotating type current regulator controls the field of the reel motor to compensate for coil build up. This regulator automatically controls the tension between the No. 5 mill stand and the reel, and a rheostat connected in the reference field circuit of the regulator is provided so that the operator can adjust the tension. An ammeter is provided to give an indication of the reel motor armature current which varies directly with the tension.

* * *

AMONG the special features of this installation are automatic electronic control of the rate of acceleration and deceleration and also provision for "preset speed" and "threading speed". With the "preset speed" feature, the mill is automatically accelerated to a desired predetermined operating speed each time a new coil of wire is threaded through the mill, merely by pressing a control button. The "threading speed" feature provides for automatic acceleration of the mill to a predetermined threading speed merely by pressing a "Thread" button. Stalled tension is provided for the reel, as well as jog forward and reverse, to facilitate entry of the end of the wire into the block.

* * *

IN reviewing the application, it is seen that, having set the speed of the mill electrically, tension is the controlling medium. The five mill stands are pulled into step by the wire itself, taking advantage of the drooping characteristics of the motors, and the speed of the reel is regulated through the VSA regulator by the tension in the wire as measured by the reel motor armature current. It might be mentioned, in passing, that many benefits are derived from rolling flat wire under controlled tension, including elimination of camber and greater accuracy.

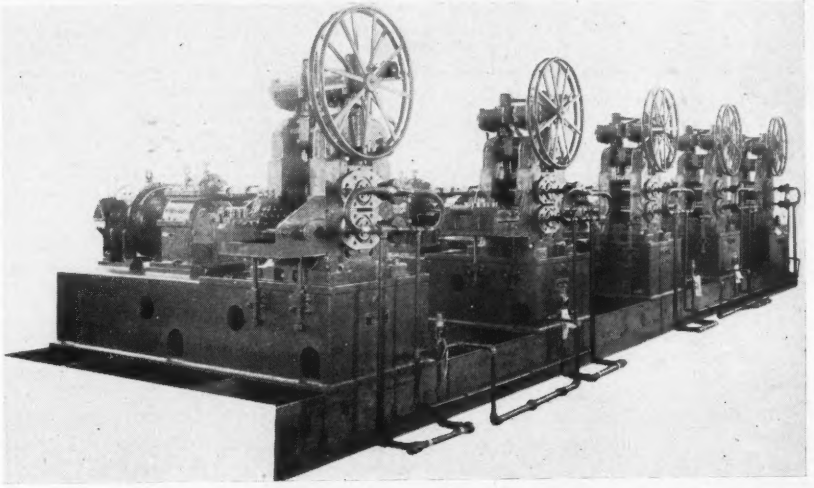


Fig. 1. — 5-stand tandem wire flattening mill.

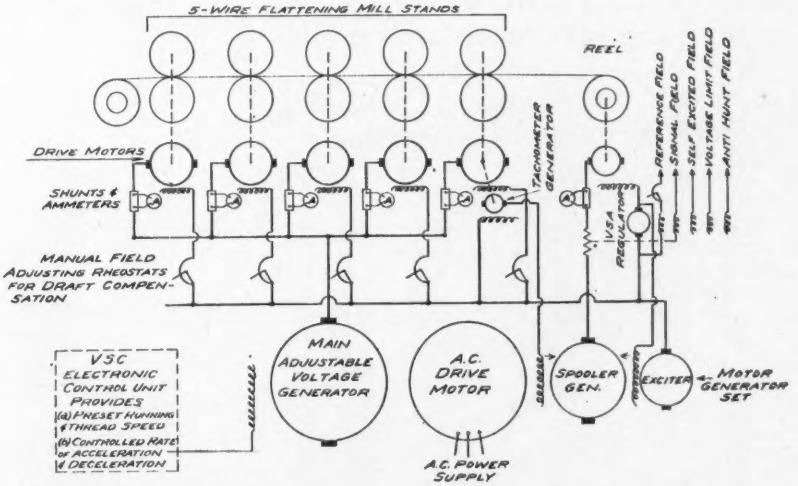


Fig. 2. — Schematic single line diagram. — Electrical drive for 5-stand tandem wire flattening mill.

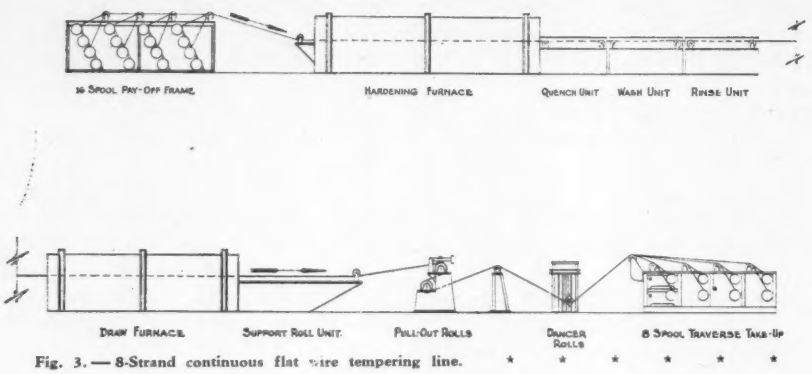


Fig. 3. — 8-Strand continuous flat wire tempering line. * * * * * *

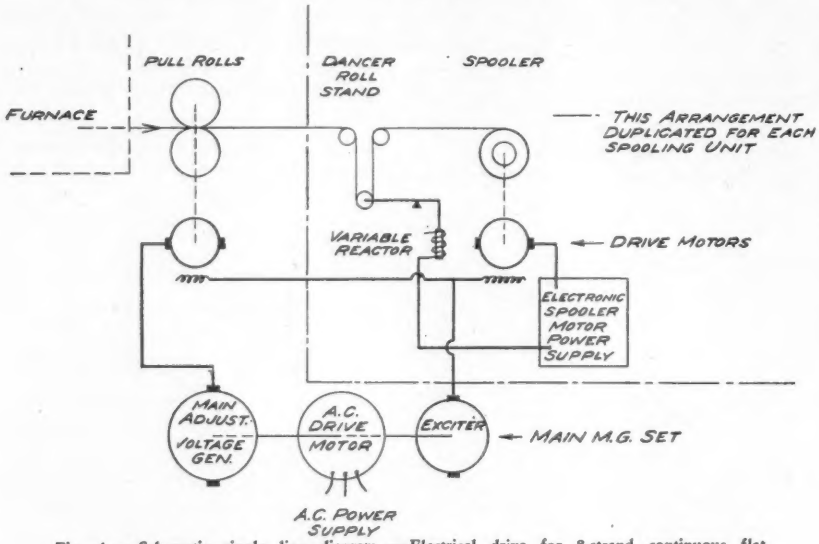


Fig. 4. — Schematic single line diagram. — Electrical drive for 8-strand continuous flat wire tempering line. * * * * * *

FROM the standpoint of flexibility, the mill motors have an operating speed range by voltage control of 3:1 and additional speed range by field control of 1½:1, giving an overall speed range of 4½:1. The reel motor has an operating speed range by voltage control of 3:1 and additional speed range by field control of 4:1, giving an overall speed range of 12:1. In installations of this type, it is possible to obtain a greater range by voltage control if the application requires it.

Spooling Equipment Application Electrical Control

FIGURE 3 shows, in elevation, an 8-strand flat wire tempering line which utilizes an entirely different scheme of electrical control. The equipment, which consists of pay-off frame, furnace, pull rolls, loop control and spooling frame is used for the continuous tempering of high carbon flat steel spring wire of from .0027 inches to .0196 inches thick and from .0393 inches to .196 inches wide. It was desired to hold the wire tension in spooling at a maximum of 2,000 pounds per square inch, corresponding to a wire pull of from 0.21 pounds to 7.6 pounds, necessitating a scheme of tension control which was both delicate and flexible. At the same time, the small wire sizes included made it perfectly feasible to use some form of loop control. The application required a lineal speed range of from 10 to 70 f.p.m. through the tempering furnace, and a coil build up of from 3 inches to 7½ inches in diameter on the spools.

* * *

THE scheme of electrical control used to meet these requirements is shown schematically in Figure 4, and was worked out by the Reliance Electric & Engineering Company. The control is largely electronic, and a special electronic dancer roll is used for the loop control. The forces required to actuate this dancer roll are so small that the maximum wire tensions specified above are not exceeded.

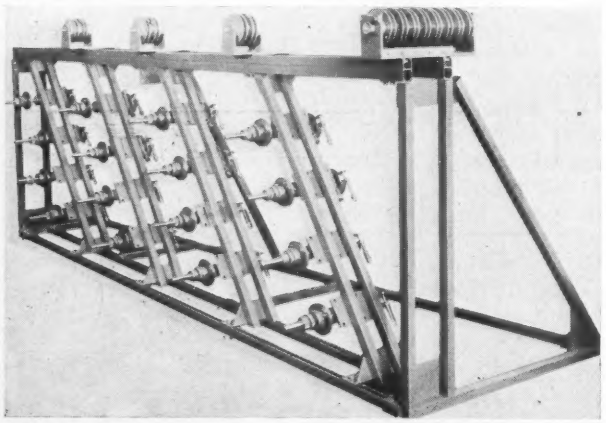


Fig. 5. — Payoff frame for spools. * * * *

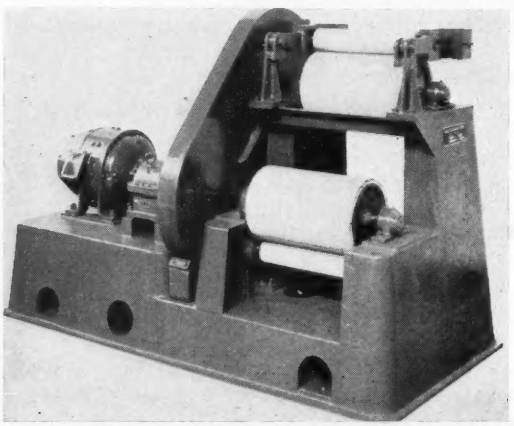


Fig. 6. — Pull roll unit. * * * *

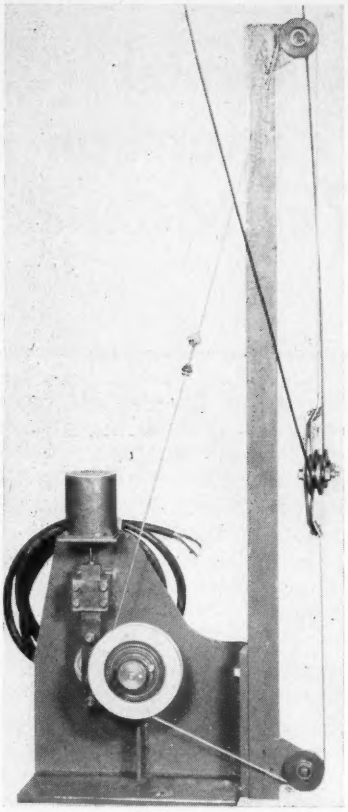


Fig. 7. — Electronic dancer roller. ★ ★

IN operation, the wire is unwound from spools mounted on a payoff frame, similar to that illustrated in Figure 5. The spindles for holding the spools are mounted in anti-friction bearings, and friction drag brakes provide back tension in the wire.

★ ★ ★

THE strands are pulled through the furnace by the pull rolls shown in Figure 6. This unit is powered by a 3 HP, 1150 r.p.m., 230 volt, D-C motor. The pull roll motor receives its power from a 3 KW D-C generator and is controlled by variable voltage to give a speed range of from 10 to 70 f.p.m. This is accomplished by means of a hand-operated rheostat operating in the generator field. The speed through the furnace is the same for all strands and is constant for any given rheostat setting.

★ ★ ★

AN electronic dancer roll unit, similar to that shown in Figure 7, is provided for each strand. These units are located between the pull roll stand and the spoolers and control the spooling speed of each strand individually.

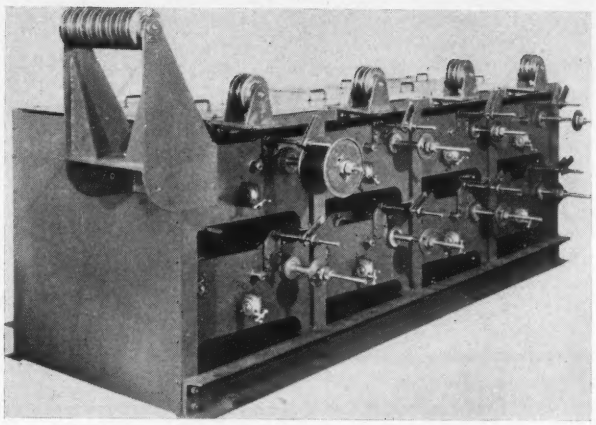


Fig. 8. — Spooling frame with individual motor driven spooling units. ★ ★ ★ ★ ★ ★

★ ★ ★

THE spoolers consist of individual motor driven traversing units mounted in a common frame as shown in Figure 8. Each unit is driven by a special ½ HP, 1750 r.p.m., 230 volt, D-C motor. A 1½ KW constant potential D-C generator is included in the main M-G set for supplying the fields of these motors. Their armature current is supplied from an electronic control panel, which converts alternating current to direct current. This control also varies the voltage of the power supplied in accordance with the signal from the electronic dancer roll, so as to control the winding speed. As the coil diameter of each spool increases during the winding operation, the spooler motor is automatically slowed down, maintaining a constant lineal speed for the wire.

THE heart of the dancer roll unit is a reactor with a sliding core. Each strand supports a counterweighted sheave which actuates a cable system to the electronic control. If the coiling speed becomes faster than the line speed which is set by the pull rolls, the loop formed in the dancer roll unit will diminish and the sheave will be raised vertically. This results in a change in the position of the reactor core, which acts through the electronic control to reduce the voltage to the reel motor and slow down the motor.

★ ★ ★

IN the application just described, the pull roll unit has an operating speed range by voltage control of 7:1. The spoolers have a speed range by voltage control of 17½:1, this being the product of 7:1 lineal speed range times 2½:1 speed range for coil buildup.

(*Please turn to page* 700)

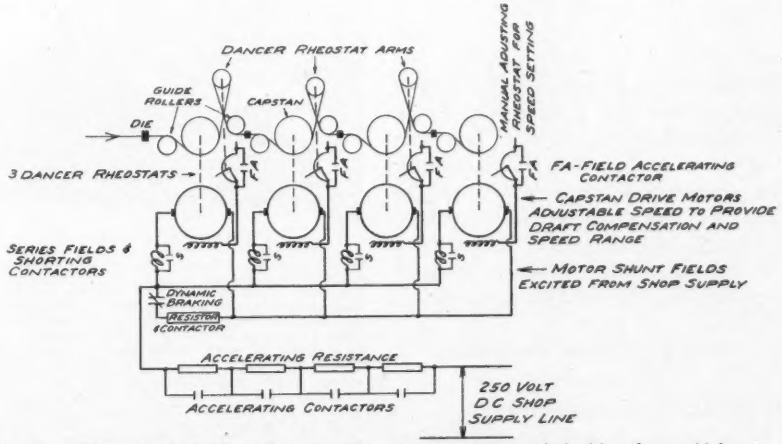

DANCER RHEOSTAT ARMS
MANUAL ADJUSTING RHEOSTAT FOR SPEED SETTING
GUIDE ROLLERS
CAPSTAN
DIE
3 DANCER RHEOSTATS
FA-FIELD ACCELERATING CONTACTOR
CAPSTAN DRIVE MOTORS ADJUSTABLE SPEED TO PROVIDE DRAFT COMPENSATION AND SPEED RANGE
SERIES FIELDS & SHORTING CONTACTORS
MOTOR SHUNT FIELDS EXCITED FROM SHOP SUPPLY
DYNAMIC BRAKING REACTOR & CONTACTOR
ACCELERATING RESISTANCE
ACCELERATING CONTACTORS
250 VOLT D C SHOP SUPPLY LINE

Fig. 9. — Schematic single line diagram. — Constant potential electrical drive for multiple motor continuous wire drawing machines. ★ ★ ★ ★ ★ ★

A Progress Report on Experimental Development of Surface Carbon Restoration in Decarburized Coiled Rod and Wire Material

by
J. L. KOZMA, Sales Engineer
Lee Wilson Engineering Company, Inc.
Cleveland, Ohio

Progressive Development

SURFACE decarburization of carbon and alloy steels in either rod, wire, or strip form has until recent years been a problem for furnace operators to combat in their annealing process. However, with the progressive development of more universal and suitable atmospheres and their application to atmosphere type furnaces and improvements in operating practices, surface decarburization in strongly susceptive steels has been immensely reduced and in most cases entirely eliminated.

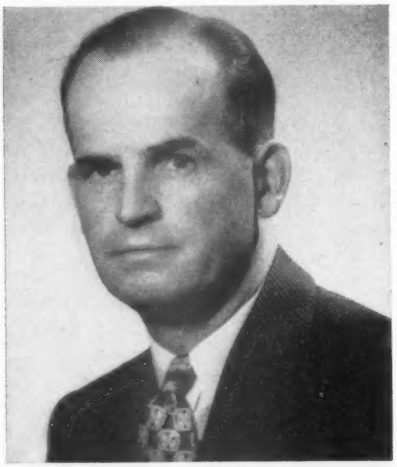
* * *

EVEN though modern gas atmosphere generating equipment has been developed to where accuracy and close control of gas constituents and ratios are easily, and in many cases, automatically maintained in operation, it still happens that furnace loads of material occasionally become decarburized in the annealing process due to either faulty operation of the gas atmosphere or furnace equipment or through lack of proper operation. In many cases, particularly on material where decarburization specifications are very rigid, such decarburized charges are rejected by the Inspection or Metallurgical Departments because they exceed the permissible limits in either depth or nature. In some instances such rejected loads may be diverted to some other application with more lenient specifications although in others, such loads have to be scrapped, resulting in both production and material losses.

* * *

Decarburization Preventive Atmospheres

THERE are several different kinds of gas atmosphere producing equipment being manufactured and used today which control decarburization. One of these atmospheres that has reached recent pre-eminence is dry nitrogen gas. This atmosphere is produced by burning any of the common fuel gases with the proper ratio of air to produce 6 to 8 % CO and H_2 combustibles. The resulting CO_2 is then chemically stripped out by absorption with monoethanolamine after which the gas is dried down to a very low dew point and introduced into the furnace at regulated pressure and at the desired volume of flow. This atmosphere is being universally applied for bright annealing of wire and strip material and when properly used in any gas tight furnace results in a product free of further decarburization due to the annealing process. Dry nitrogen gas atmosphere in addition to being used for decarburization free annealing is also suitable as a carrier for hydrocarbon gases in gas carburizing and carbon restoration processes.



JULIUS L. KOZMA

Born March 14, 1907 in Crescent, Ohio. Attended schools in Youngstown, Ohio. Graduated from Tri-State College in 1930 with Bachelor of Science degree in Mechanical Engineering. Employed in Engineering Department of the Carnegie-Illinois Steel Corp., Ohio Works, at Youngstown, Ohio, from 1930 to 1937. With Republic Steel Corp., Cleveland, Ohio, at the Corrigan-McKinney Engineering Dept., and 98" Strip Mill Metallurgical Laboratory from 1937 to 1939. Became associated with the Lee Wilson Engineering Co., Inc., in 1939, serving as design, field and project engineer on bell type annealing furnaces and protective atmosphere equipment. Registered Professional Engineer, State of Ohio. * * *

* * *

Trend Towards Decarburization Free Material

THERE seems to be a consistent trend on the part of steel purchasers in requesting material entirely free of surface decarburization. Some steel makers and suppliers are now furnishing decarburization free materials by grinding off the decarburized surface. While such a grinding process seems to serve the purpose, it is a very costly one. For this reason suppliers of decarburization free steel have been on a constant lookout and are interested in a less costly and faster process by which they could get equivalent results. Some manufacturers of furnace and gas atmosphere producing equipment who were able to foresee the need for such a process have taken up the development to obtain decarburization-free steel by means of carbon restoration through a carbon supplying gas atmosphere which in most cases is carried along with the regular annealing cycle.

* * *

Carbon Restoration Process

PROCESSES of restoring carbon to the decarburized surfaces of the material to the extent that the surface carbon composition be equivalent to that of the core section are known by several names or terms, such as, Carbon Restoration, Skin Recovery, or Carbon Correction. The principal difference

between carbon restoration and gas carburizing is that in carbon restoration the object is to restore carbon to the decarburized surface of the material to the decarburized depth only, and to a carbon content equal to that of the cross section analysis. In case or gas carburizing, a case of a desired depth and of a carbon content suitable for the hardness and heat treatment of the product, is required.

* * *

THE subject matter of this paper is intended as a report on experimental test charges of decarburized rod material run through carbon restoration cycles for carbon recovery purposes. With this report is included a complete data sheet showing all important data on the various charges and of results obtained.

* * *

Description of Equipment

THE furnace used in this carbon restoration process was a **Lee Wilson**, circular type, radiant tube furnace of 48″ diameter x 84″ high charge size. The work was enclosed in an alloy inner cover and sealed in oil, with an outer water seal in circulation to keep sealing oil cool. The atmosphere gas was dried nitrogen produced in an exothermic gas generating unit, the nitrogen atmosphere in this case was used merely as a carrier gas for the methane or natural gas to provide the carburizing media. Both the nitrogen carrier gas and hydrocarbon natural gas were measured by individual orifice type flow meters. The two gases after being measured were mixed in the inlet gas line to the furnace base and introduced into the furnace. This mixed gas was circulated through the inner cover and discharged through an outlet pipe. The furnace base was provided with a high temperature recirculating fan to circulate the atmosphere gases.

* * *

Mechanism of Carbon Restoration

CARBON restoration, like gas carburizing, has to be carried on at high temperatures. While much gas carburizing is being done at 1700°F, it is not necessary to go to this temperature for restoration, although both carbon absorption and diffusion is much more rapid at increased temperatures. Since steel will not absorb much carbon in the ferritic state but will absorb and diffuse carbon in the austenitic state, it is necessary to have the work near the upper critical or Ac3 point. Temperatures much higher than the Ac3 point in carbon restoration are to be avoided if possible in order to prevent austenitic grain growth or coarsening, particularly if the time at temperature is long. In establishing the temperature at which restoration work should be done, it would be safer to aim at the higher side in order to be sure that the Ac3 point is exceeded slightly, or resort to an exact determination for the particular steel being worked on. It should also be noted that the surface of the steel to which carbon restoration is applied has been decarburized and does not represent a true analysis of the carbon content of the particular grade or type of steel for which the upper critical point is selected. Since the carbon content at the decarburized surface is lower, a critical point for a lower carbon grade would be more applicable and would tend to compensate for such variable and erroneous conditions.

* * *

Control of Carbon Content and Penetration

THE carbon content, depth of penetration and uniformity of content throughout the depth of restored surface are dependent on the following factors:

1. **Temperature of the steel at or above Ac3, the variation of temperature governing rate of absorption and diffusion of active carbon from the hydrocarbon gas.**
2. **Composition of carburizing gas atmosphere, the activity of gas governing the rate of active carbon absorption at the surface and also the rate of replenishment as active carbon from the hydrocarbon is diffused inwardly.**
3. **Period of time that steel is held at temperature to permit proper diffusive depth of penetration and uniformity of carbon distribution in the austenite grains.**

* * *

Gas Composition

ALTHOUGH gas carburizing is in some cases being done with a raw hydrocarbon gas, the most common practice is to dilute the hydrocarbon gas with some other prepared atmosphere, in which case the atmosphere gas is considered a carrier. By diluting in this manner, sooting can be almost entirely eliminated. In these experimental tests a prepared atmosphere of nitrogen, produced by burning natural gas slightly on the reducing side, scrubbed of CO_2 by chemical absorption and dried to a low dew point was used as the carrier for the natural gas. This is an ideal gas for this purpose, as it is only mildly reducing and is free of CO_2 and very low in H_2O. By using this gas, the complex gas mixtures within the furnace retort are reduced in number of constituents, and reactions of gases with each other are retarded if not entirely eliminated. By eliminating or reducing the activity of such intergaseous reactions, the number of existing variables in the work is reduced, giving more uniform and consistent results.

* * *

IT is the opinion of some authorities that all water vapor or H_2O in the carrier gas should be eliminated while others are of the opinion that a small amount of water vapor in the hydrocarbon carrier gas mixture is necessary in order to start a carburizing action on the surface of the steel. Others are of the opinion that definite proof or explanation of the mechanism requires further study, which is probably correct. The writer feels that the matter of having a uniform and consistent quantity of H_2O in the gas at all times during the restoration cycle and also of consistent content in all loads and charges is far more important.

* * *

NATURAL gas consists of about 80% methane (CH_4).

* * *

THE carrier gas had the following average composition:

CO_2	=	0.00%
CO	=	2.6
H_2	=	2.6%
H_2O	=	0.025%
N_2	=	94.775%
Total	=	100.0%

FIG. NO. 1

August 25, 1947

TABLE OF CONDENSED DATA REGARDING CARBON RESTORATION TESTS
ON SURFACE DECARBURIZED 1035 AND 1038 STEEL ROD

Column Headings	Test #1	Test #2		Test #3		Test #4	Test #5		Test #6			Test #7
	Charge & Test Pieces	Charge	Test Pieces	Charge	Test Pieces	Dummy Test Pieces Only	Charge	Test Pieces	Charge	Test Pieces	Test Pieces Before Spheroidizing	Charge #5 Re-run
CHARGE AND TEST SPECIMENS												
Rod Diameter	0.762"	0.762"		0.762"		0.364"	0.364"	0.762"	0.364"	0.762"	0.364"	
Rod Composition**	Lot 1	Lot 1		Lot 1		Lot 2	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 2
Extent of Decarburization	(See under Results, below)											
Ultimate Tensile Strength*(PSI) (Before Restoration)	68,000 to 73,000	68,000 to 73,000		68,000 to 73,000		61,000 to 64,000	61,000- 64,000	68,000- 73,000	61,000- 64,000	68,000- 73,000	61,000 to 64,000	61,000 to 64,000
Surfact Condition	Bare	Limed	Bare	Limed	Bare	Limed	Limed	Bare	Limed	Bare	Limed	Limed
Charge Weight	3900#	3900#		3900#			3000#		3000#			3000#
CYCLE AND TREATMENT												
Temperature												
Restoration Temperature	1550°F.	1500°F.		1550°F.		1550°F.	1550°F.		1550°F.		(Recarb.)	1550°F.
Spheroidizing Temperature	1345°F.	1345°F.		1345°F.		None	1345°F.		1300°F.		(cycle)	1300°F.
Time											(same as)	
Restoration Time	3 hr.	6 hr.		6 hr.		3 hr.	6 hr.		6 hr.		(for)	3½ hr.
Spheroidizing Time	5 hr.	5 hr.		5 hr.		None	4 hr.		4 hr.		(charge)	4 hr.
CO_2 Stripped Gas											(and test)	
Flow Rate of Stripped Gas	140 CFH	140 CFH		140 CFH		140 CFH	140 CFH		140 CFH		(pieces;)	140 CFH
Composition of Stripped Gas											(no)	
During Restoration											(spheroid.)	
CO_2, %	0.0	0.0		0.0		0.0 to 0.1	0.0		0.0		(cycle)	0.0
O_2, %	0.0	0.0		0.0		0.0	0.0		0.0			0.0
CO, %	2.4 to 4.8	2.0 to 2.6		2.4 to 2.8		1.5 to 2.6	2.2 to 3.0		0.8 to 2.2			1.8 to 2.0
During Spheroidizing												
CO_2, %	0.0 to 0.2	0.0 to 0.9		0.0		(No)	0.0		0.0			0.0
O_2, %	0.0	0.0		0.0		(Shperoid)	0.0		0.0			0.0
CO, %	2.4 to 3.2	1.3 to 2.8		2.5		(izing)	2.2		0.8 to 1.2			1.8 to 2.0
Dew Point Stripped Gas												
During Restoration	-41 to -18°C.	-43 to -15°C.		-23 to 0°C.		-25 to -5°C.	-46 to -33°C.		-40 to -20°C.			-30 to -26°C.
During Spheroidizing	-31 to -24°C.	-28 to -18°C.		-23 to -20°C.		-	-39 to -28°C.		-28 to -20°C.			-32 to -26°C.
Natural Gas												
Flow First Portion Restor'n	5.7 CFH	5.7 CFH		5.7 CFH		20 CFH	21 CFH		21 CFH			16 CFH
% First Portion Restor'n	4.0%, 8½ hr.	4.0%, 2¼ hr.		4.0%, 2¼hr.		14.3%, 1¼ hr.	15.0%, 7-3/4hr.		15.0%, 6½ hr.			11.4%, 3½ hr.
Flow Second Portion Restor'n	5.7 CFH	12.4 CFH		12.4 CFH		24 CFH	13.0 CFH		12 CFH			15 CFH
% Second Portion Restor'n	4.0%, 8½ hr.	8.9%, 9-3/4hr.		8.9%, 7-3/4hr.		17.1%, 8-3/4 hr.	9.3%, 1 hr.		8.6%, 2½ hr.			10.7% 2½ hrs.
Flow During Spheroidizing	5.7 CFH	5.7 CFH		5.7 CFH		None	13.0 CFH		12 CFH			14.5 CFH
% During Spheroidizing	4.0%, 10¼hr.	4.0%, 10 hr.		4.0%, 10-3/4hr.		None	9.3%, 11 hr.		8.6%, 10½ hr.			10.3%, 11-3/4 hr
Outlet Mixed Gases												
Composition Outlet Gases												
During Restoration												
CO_2, %	0.0 to 0.6	0.0 to 2.0		0.0		0.2	0.0 to 0.2		0.0 to 0.6			0.0 to 1.0
O_2, %	0.0	0.0		0.0 to 2.4		0.0	0.0		0.0			0.0

Outlet Mixed Gases							
Composition Outlet Gases During Restoration							
CO_2, %	0.0 to 0.6	0.0 to 2.0	0.0	0.2	0.0 to 0.2	0.0 to 0.6	0.0 to 1.0
O_2, %	0.0	0.0	0.0 to 2.4	0.0	0.0	0.0	0.0
CO, %	2.2 to 3.6	1.6 to 3.8	0.8 to 4.4	2.0	1.4 to 2.4	0.8 to 6.6	1.6
During Spheroidizing							
CO_2, %	0.1 to 0.2	0.0 to 0.8	0.0	None	0.0	0.0 to 0.2	0.0
O_2, %	0.0	0.0	0.0		0.0	0.0	0.0
CO, %	2.4 to 3.2	1.8 to 4.8	2.0 to 3.3		1.8 to 2.0	1.0 to 2.0	1.0
Dew Point Outlet Gases							
During Restoration	-29 to 2°C.	-20 to 8°C.	-17to 11°C.	-4to 15°C.	-19 to 2°C.	-26 to 10°C.	-16 to 6°C.
During Spheroidizing	-30 to-21°C.	-18 to-10°C.	-24to-17°C.	-	-24 to-18°C.	-25 to -2°C.	-22 to -14°C.
RESULTS							
Amount of Sticking	3/4 distance up stack	None / Stuck to tie wire	None / Stuck to tie wire				
Carbon Distribution from Surface							Center Coil / Top Coil
Before Restoration							
.000 - .003"	.02						
.003 - .006"	.02						
.006 - .009"	.04						
.009 - .012"	.06						
.012 - .015	.14						
.000 - .006"		.03 .03	.03	.07	.07 .03	.07 .03 .07	.44 / .61
.006 - .012"		.06 .06	.06	.15	.15 .06	.15 .06 .15	.36 / .42
.012 - .018"		.14 .14	.14	.27	.27 .14	.27 .14 .27	.33 / .35
.018 - .024"		.25 .25	.25	.32	.32 .25	.32 .25 .32	.31 / .31
.024 - .030"		.34 .34	.34	.36	.36 .34	.36 .34 .36	.32 / .32
.030 - .036"				.37	.37	.37 .37	.32 / .33
Reduced Cross Section	.38	.39 .39	.39	.37	.37 .39	.37 .39 .37	.36 / .36
Full Cross Section	.36	.36 .36	.36	.34	.34 .36	.34 .36 .34	.36 / .36
After Restoration							
.000 - .003"	.14						
.003 - .006"	.16						
.006 - .009"	.15						
.009 - .012"	.18						
.012 - .015"	.21						
.000 - .006"		.16 .17	.22 .19	.50	.44 .52	.24 .24 .42	.49 / .47
.006 - .012"		.19 .18	.22 .21	.32	.36 .42	.32 .26 .35	.42 / .40
.012 - .018"		.20 .22	.22 .23	.23	.33 .31	.33 .27 .32	.39 / .36
.018 - .024"		.25 .25	.25 .26	.25	.31 .27	.33 .29 .31	.37 / .35
.024 - .030"		.27 .30	.26 .31	.29	.32 .29	.33 .29 .32	.35 / .35
.030 - .036"			.29	.32	.32 .31	.32 .31 .32	.34 / .34
Reduced Cross Section	.36	.38 .38	.37 .38	.37	.36 .38	.35 .38 .36	.35 / .34
Full Cross Section	.33	.35 .36	.35 .36	.35	.36 .38	.36 .37 .36	.36 / .37
Degree of Spheroidization*-***	30 to 70%	50-80%	75-80% 50-60%	-	40-80%	30-60%	
Ultimate Tensile Strength*(PSI)	67,700 to 70,790	67,190-69,600	67,190 69,800-69,600 71,330		66,820-75,000	65,010-67,880	
Date of Test Charge	3/1/41	3/7/47	3/17/47	4/5/47	4/9/47	4/11/47	4/17/47

*Top, Middle and Bottom Coils (10-13 coils in each stack)

***Arbitrary visual rating; 50 to 80% usual, 60% average.

**Rod Composition

	C	Mn	P	S	Si	
Lot #1	0.36	0.77	0.014	0.035	0.15	#C-1035 (S.A.E.)
Lot #2	0.40	0.64	0.011	0.035	0.14	#C-1038 (S.A.E.)

A carburizing reaction between CH_4, CO and Fe at elevated temperatures, may be shown by the following equations:

$$CH_4 + 3\ Fe. = Fe_3C + 2H_2$$
$$2CO + 3\ Fe. = Fe_3C + CO2$$

* * *

SINCE both of the above reactions are reversible, the reactions from left to right are carburizing and from right to left, when reversed, decarburizing. It can also be seen that in the decomposition of CH_4 and CO free H_2 and CO_2 are continually being formed as shown by the following equation:

$$CH_4 = C + 2H_2$$
$$2CO = C + CO_2$$

* * *

IN observing the interacting reactions between the various gas components as shown in the following equations

$$CO_2 + H_2 = CO + H_2O$$
$$CH_4 + H_2O = CO + 3H_2$$

it can be seen that water vapor (H_2O) maintains an important part in all these reactions, and since a definite ratio of $CO:CO_2$, $H_2:CH_4$ and$H_2:H_2O$ is established by reactions, and to a stage of equilibrium for any particular temperature in presence with steel, it can also be seen that if the H_2O content of the entering atmosphere or carburizing gas varies or fluctuates to any great extent, inconsistent H_2O contents can upset the various ratio pairs of gases and destroy the equilibrium that they are trying to establish. By virtue of this analysis, the importance of consistent dew points or H_2O content of the carrier gas is being emphasized rather than what H_2O content the gas actually should have.

* * *

WITH the continued flow of methane into the furnace to replenish that which is being consumed in dissociation, the carburizing activity will continue so long as the flow of hydrocarbon gas persists.

* * *

Description of Experimental Charges

ALTHOUGH the accompanying data sheet which contains all the collected data of importance relating to these experimental test charges, a brief summary pertaining to each charge is given in the following section. It should be mentioned here that although fairly satisfactory results of carbon restoration on some of these charges were obtained, the primary objective, particularly at the start of the test program, was not entirely to perform an illustrative job of carbon restoration but also to observe and study various reactions, characteristics, and behavior of gases and reasons for their behavior along with the results with respect to various degrees of restoration.

* * *

SINCE all the wire or rod coils in these experimental charges were originally decarburized in the spheroidizing anneal process, or in hot rolling, this material was put through a predetermined carbon restoration cycle, then fast cooled below the lower critical point and reheated again to the lower critical and slow cooled to obtain the original or desired spheroidized structure. Typical restoration and spheroidizing cycles were as follows:

* * *

Typical Restoration Cycle

LOAD wire on furnace base, insert thermocouples in top and bottom coils, place inner cover over charge and fill oil and water seals. Start base recirculating fan in forward direction and purge inner cover thoroughly with nitrogen gas at flow rate of about 140 C. F. H. After purging is completed (about 2 hours), take gas analysis and dew point of ingoing and outgoing atmosphere gas. Place furnace bell over inner cover, light up furnace and heat to 1550°F. Close large 1¼″ atmosphere discharge line outlet from base, with gas left to bleed through ¼″ outlet line only, in order to maintain about 0.5″ water column, inner cover pressure. Turn in natural gas when steel has reached 900°F. at 12 to 20 C. F. H. (varied with different charges). Soak at 1550°F. for 6 hours with natural gas on. At end of 6 hour soak shut off furnace, remove furnace with natural gas flow reduced to 12 C. F. H.

Typical Spheroidizing Cycle

AFTER the charge from previous restoration cycle has cooled down to 900°F., place furnace bell over inner cover and light up furnace. Heat to 1345°F. with natural gas flow at from 10 to 12 C. F. H. and soak for 4 hours. At end of soak period slow furnace cool at 20° per hour to 1200°F., slow furnace cool from 1200° to 1150°F. at 50° per hour and at end of slow cool period shut down furnace and remove from inner cover. Shut off natural gas but retain flow of 140 C. F. H. nitrogen gas until charge has fast cooled under the inner cover to 800°F. Shut off nitrogen gas at 800°, shut off recirculating fan, drain oil and water seals and uncover the charge. For exact data on natural gas flow rates, charge cycles etc., refer to attached data sheet showing complete data for experimental test charges #1 to 7 inclusive.

* * *

Test Charge #1

THIS first test charge consisted of about 3,900# of C-1035 coiled rod material previously decarburized to the percentage carbon content shown on the general data sheet.

* * *

THE general data sheet gives all important data collected and pertaining to these tests. An additional data sheet is also tabulated which gives the decarburization and its nature as obtained by microscopic examination of the test pieces before and after carbon restoration. On this first charge the coils were pickled, rinsed and dried before loading on the spindle and furnace base. The restoration temperature for this charge was selected as 1550°F. and the charge was held at this temperature for 3 hours for restoration time. The atmosphere gas contains about 2.5% CO and about 2.5% H_2, and the flow rate of this carrier gas is 140 C. F. H. at all times during the entire cycle. The carrier gas was enriched with natural gas at a flow rate of 5.7 C. F. H. which is 4.0% by volume to carrier gas. In checking the carbon content by chemical analysis,

turnings from the test pieces both before and after restoration were taken in steps of .003″ off the radius, and surface turnings of five different steps were taken ranging from .003″ to .015″ for final surface check.

* * *

THE carbon content of the surface depth at .000″ to .003″ before restoration was .02% and after restoration, .14%, it is quite evident that an insufficient quantity of natural gas was being introduced to the work.

* * *

BEFORE carbon restoration, total decarburization or free ferrite depth ranged from .010″ to .016″ depth as observed by microscopic examination. After carbon restoration, carbon had been restored to the free ferrite areas and to the extent that free ferrite no longer existed at the surface, although the carbon penetration was mostly along the free ferrite grain boundaries, particularly those nearer the surface.

* * *

ON this charge which was processed "bare" or without a lime coating after pickling, the problem of fusing of strands and the bundle tie wires was encountered at the restoration temperature of 1550°F. Most of this strand and tie wire fusing occurred in the lower half of the load stack which carried the heavier weights of the load.

* * *

Test Charge #2

THIS second charge consisted of the same type and weight as #1. The rod coils in this charge were pickled, rinsed, and lime coated. The restoration temperature for this charge was 1500°F. to observe its effect on strand and tie wire fusion. The time at restoration temperature for this charge was 6 hours, an increase of 3 hours over that of #1 charge. The natural gas was introduced into the inner cover with charge at approximately 840°F., at a flow rate of 5.7 C. F. H. and at a percentage of 4.0% to that of 140 C. F. H. nitrogen carrier gas. This natural gas input was later increased to 12.4 C. F. H. or 8.9% at the time the steel temperature had reached 1300°F. This flow rate of natural gas was maintained until the end of the 6 hour restoration cycle. During the spheroidizing cycle a flow rate of 5.7 C. F. H. or 4.0% of natural gas was used to provide carbon potential to prevent possible decarburization during the spheroidizing cycle.

* * *

ON this charge and all the following test charges, the surface metal turnings were taken in steps or depths of .006″, as indicated by the chemical carbon analysis percentage figures on the general data sheet. On this and following charges 6 cuts were taken, ranging from .006″ to .036″ on the radius depth. The carbon content by chemical analysis, before restoration, at the first cut of .000 to .006″ was .03% carbon and after restoration it was .17% carbon or an increase of .14%.

* * *

FROM the results obtained, it is apparent that still an insufficient quantity of hydrocarbon gas was being supplied. Microscropic examination showed that carbon, however, was restored to the extent that no free ferrite existed at the surface. No sticking or fusion of the lime coated rods had taken place in this charge.

* * *

Test Charge #3

THIS test charge was run the same as #2 except that the restoration temperature was increased to 1550°F. The volume of natural hydrocarbon gas was the same as for charge #2. A very slight increase in restored carbon content was obtained. For data on results obtained refer to general data sheet.

* * *

Test Charge #4

THIS charge consisted of only three test pieces, about 18″ long, cut from the ends of .364″ diameter C-1038 rods, tied to the top, middle, and bottom of a coil loading spindle.

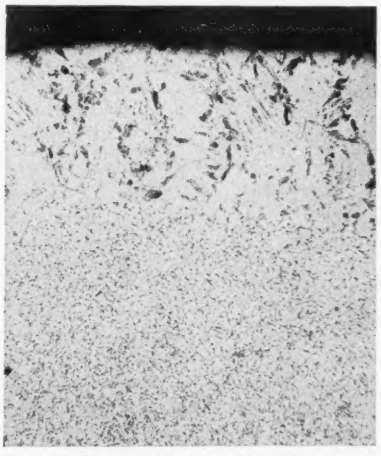
* * *

THE objective in running this charge of three test pieces was only to see what carbon content would be obtained with a considerable increase of natural gas to provide greater carburizing activity, even though it might be to the extent where the decarburized surface areas might be restored to a carbon content higher than the core section.

* * *

THE temperature for this restoration cycle was 1550°F. and the soaking time was 3 hours. The flow of natural gas introduced into the furnace immediately upon lighting up was 20 C. F. H. or 14.3%, and this flow was soon afterwards increased to 24 C. F. H. or 17.1%,

Lot #1. .762″ Rod
Before Restoration
F.F.D. — .010/.014″
M.A.D. — .017/.022″



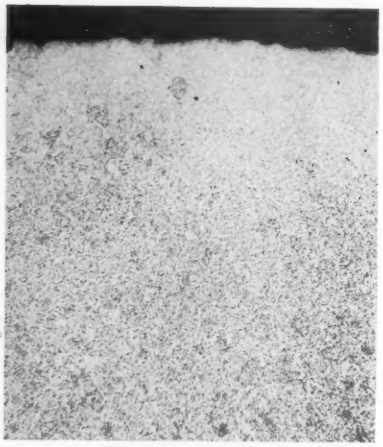
Lot # 1. .762″ Rod
After Restoration
F.F.D. — Nil
M.A.D. — .020/.024″
Fig. 2. — Photomicrographs representative of the structure at the surface of rods from charge #3. Magn. 100 x. * * *

the steel temperature at this time being 800°F. on the heating up part of the cycle. This flow rate was maintained during the entire time at temperature of 1550°F.

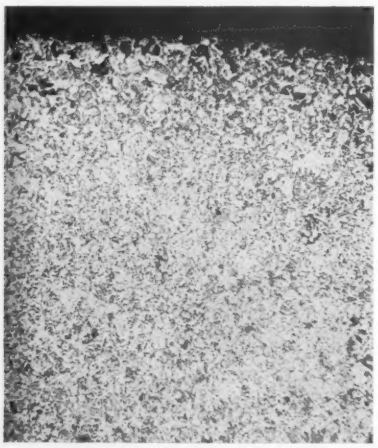
* * *

THE carbon content of this charge test piece was .07% at the .000 to .006" depth, before restoration, and .50% after restoration. For carbon content at the progressive depth analysis, refer to general data sheet. Although the carbon content at the surface after restoration was higher than that desired, this test did indicate and confirm the fact that sufficient carbon can be absorbed by this process if desired, providing that the volume of hydrocarbon gas being supplied is sufficient. In observing the results obtained, it appears that the carbon potential of the carburizing gas was too high for the steel concerned and the reason for the carbon content at the first cut of .006" depth being 18 percentage points higher than that of the second cut of .012" depth is that the rate of nascent carbon supply and rate of absorption at the surface of the steel was faster than the rate of diffusion inward. This could be corrected by reducing the carbon potential and possibly also by increasing the time at temperature. In this manner a deeper and more uniform penetration could be obtained.

* * *



Lot #2. .364" Rod
Before Restoration
F.F.D. — .004/.008"
M.A.D. — .012/.016"



Lot #2. .364" Rod
After Restoration
F.F.D. — Nil
Higher Carbon Depth .009/.012"
Fig. 3. — Photomicrographs representative of the structure at the surface of rods from charge #5. Magn. 100 x. * * *

Test Charge #5

THIS test charge consisted of about a 3000# load of coiled rod material, which was pickled, limed, and dried before loading. This charge was C-1038 type steel .364" in diameter. In with this test charge there were also 3 test pieces of type C-1035, .762" in diameter, placed at the top, center and bottom of the coil stack.

* * *

THE restoration temperature for this charge was 1550°F. and the soaking time, 6 hours. Natural gas was introduced at a flow rate of 21 C. F. H. or 15.0% during the heating up cycle with the steel at 1100°F. This flow rate was maintained during the entire heating and restoration soak period, but reduced at the end of the soak period to 13 C. F. H. or 9.3%. For the spheroidizing portion of the treatment, a flow rate of 13 C. F. H. or 9.3% was used with a temperature of 1300°F. for 4 hours. For results on carbon content and penetration refer to general data sheet.

* * *

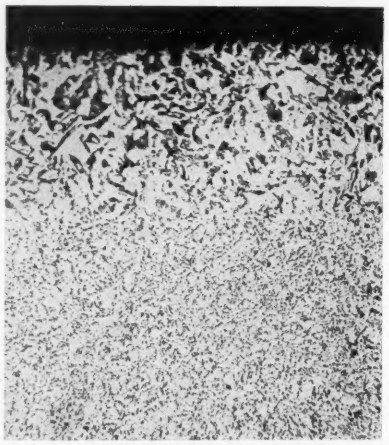
Test Charge #6

THIS test charge consisted of about 3,000# load of the same type and size as Charge #5. In addition to this load, there were also 3 test pieces from lot #1 placed in this charge.

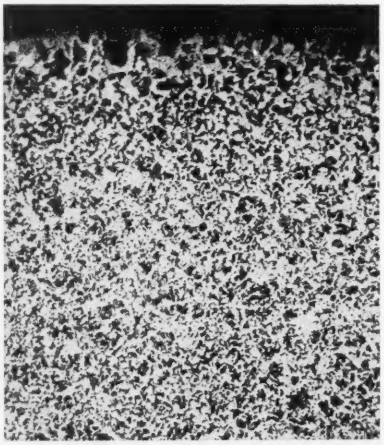
NATURAL gas for the first portion of the restoration cycle was introduced at a flow rate of 21 C. F. H. or 15% with the steel at 1130°F. The flow was reduced to 12 C. F. H. or 8.6% after 4 hours at temperature of 1550°F., meaning that during the first 4 hours of the 6 hour soak, the flow rate of natural gas was 21 C. F. H. and for the last 2 hours it was 12 C. F. H.

* * *

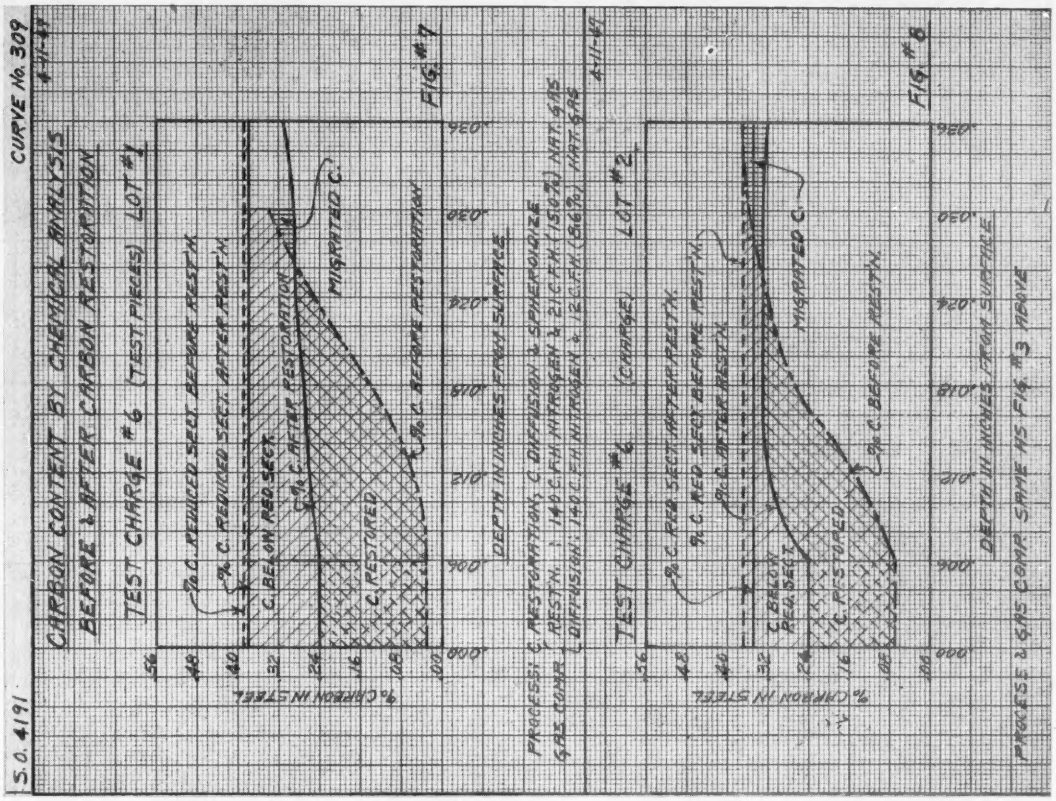
THESE last 2 hours at temperature were intended to be a diffusion time period with flow of natural gas being reduced. The

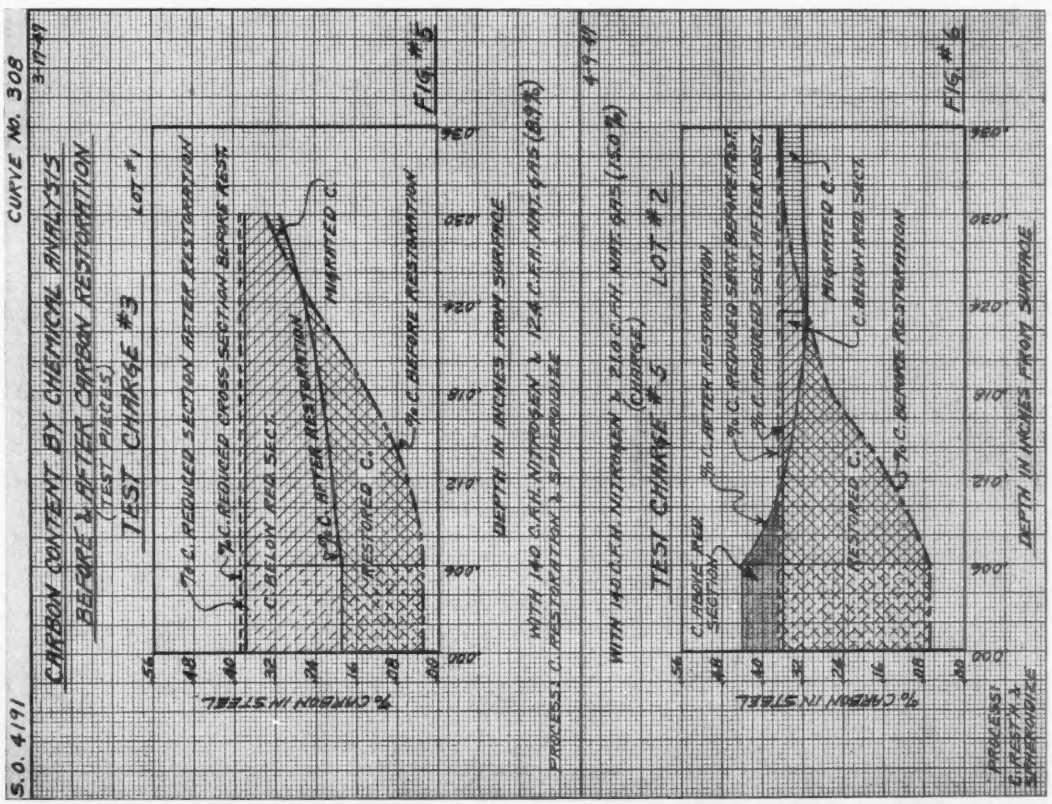


Lot #1. .762" Rod
F.F.D. — Nil
M.A.D. — .012/.015"



Lot #2. .364" Rod
F.F.D. — Nil
M.A.D. — .011/.015"
Fig. 4. — Photomicrographs representative of the structure at the surface of rods from test charge #6 after carbon restoration. Magn. 100 x.


CURVE No. 309
S.O. 4191
CARBON CONTENT BY CHEMICAL ANALYSIS
BEFORE & AFTER CARBON RESTORATION
TEST CHARGE #6 (TEST PIECES) LOT #1
% C. REDUCED SECT. BEFORE REST'N.
% C. REDUCED SECT. AFTER REST'N.
% C. AFTER RESTORATION
% C. BEFORE RESTORATION
MIGRATED C.
C. BELOW RED. SECT.
C. RESTORED
% CARBON IN STEEL
DEPTH IN INCHES FROM SURFACE
FIG. #7
PROCESS: C. RESTORATION, C. DIFFUSION & SPHEROIDIZE
GAS COMP. RESTN.: 1.4% C.P.H. NITROGEN & 21% C.P.H. (150%) NAT. GAS
C. DIFFUSION: 1.4% C.P.H. NITROGEN & 12% C.P.H. (86%) NAT. GAS
4-11-47
TEST CHARGE #6 (CHARGE) LOT #2
% C. RED SECT. AFTER REST'N.
% C. RED SECT. BEFORE REST'N.
% C. AFTER REST'N.
% C. BEFORE REST'N.
MIGRATED C.
C. BELOW RED SECT.
C. RESTORED
FIG. #8
PROCESS & GAS COMP. SAME AS FIG. #3 ABOVE


CURVE No. 308
S.O. 4191
CARBON CONTENT BY CHEMICAL ANALYSIS
BEFORE & AFTER CARBON RESTORATION
(TEST PIECES)
TEST CHARGE #3 LOT #1
% C. REDUCED SECTION AFTER RESTORATION
% C. REDUCED CROSS SECTION BEFORE REST.
C. BELOW RED. SECT.
% C. AFTER RESTORATION
% C. BEFORE RESTORATION
MIGRATED C.
RESTORED C.
% CARBON IN STEEL
DEPTH IN INCHES FROM SURFACE
FIG. #5
PROCESS: C. RESTORATION & SPHEROIDIZE
WITH 140 C.F.H. NITROGEN & 112 C.F.H. NAT. GAS (80%)
4-9-47
WITH 140 C.F.H. NITROGEN & 210 C.F.H. NAT. GAS (150%)
(CHARGE)
TEST CHARGE #5 LOT #2
% C. ABOVE RED. SECTION
% C. AFTER RESTORATION
% C. REDUCED SECT. BEFORE REST.
% C. REDUCED SECT. IN TEST PIECE
MIGRATED C.
C. BELOW RED. SECT.
C. RESTORED
% C. BEFORE RESTORATION
% CARBON IN STEEL
DEPTH IN INCHES FROM SURFACE
FIG. #6
PROCESS: C. REST'N. & SPHEROIDIZE

DATE: 10/17/47 TABLE NO. 10 SK. #378

TABLE SHOWING VISUAL DECARBURIZATION AND RESTORATION

BY MICROSCOPIC EXAMINATION

TEST CHARGES NO. 3, 5 & 6

Test Chge.	Lot No. Size	Test Sample No.	Condition	Decarb. F.F.D. Inches	DECARB. M.A.D. INCHES			Tensile P.S.I.	% Spher-oidized	Location in Chge.
					L.C.	*U.N.	H.C.			
Test Chge. No. 3	Lot No. 1 .762" Dia.	14 F	Before	.010/.014		.017/.022		67,190	75/80	-
		19	After	Nil	.011/.018	.030		69,800	60	Bottom
		20	"	"	.012/.016	.030		71,330	60	Middle
		21	"	"	.010/.018	.030		70,650	50/60	Top
Test Chge. No. 5	Lot No. 1 .762" Dia.	14 F	Before	.010/.014		.017/.022		67,190	75/80	-
		22	After	Nil			.010/.015	-	80/85	Bottom
		23	"	"			.010/.017	-	70/80	Middle
		24	"	"			.014/.020	-	80/85	Top
	Lot No. 2 .364" Dia.	1	Before	.004/.008		.012/.016		61,060	90	Bottom
		3	"	.004/.007		.013/.017		61,060	85	Top
		1	After	Nil			.009/.016	75,000	40/50	Bottom
		2	"	"			.009/.016	69,710		Middle
		3	"	"			.009/.016	66,820		Top
Test Chge. No. 6	Lot No. 1 .762" Dia.	14 F	Before	.010/.014		.017/.022		67,190	75/80	
		25	After	Nil			.014/.018	-	40	Bottom
		26	"	"			.012/.015		30/40	Middle
		27	"	"			.010/.016		40	Top
	Lot No. 2 .364" Dia.	Original	Before	.003/.008		.011/.017		-	-	
		1	After	Nil			.007/.012	67,880	30/40	Bottom
		5	"	"			.011/.015	65,010	60	Middle
		3	"	"			.010/.015	66,340	40	Top
	Lot No. 2 .364" Not Spher-oid-ized	Original	Before	.003/.008		.011/.017		-	-	
		4	After	Nil			.015/.020	79,350	None	
		2	"	"	.035		.007/.010	75,050	"	
		6	"	"			.012/.015	77,890	"	

*U.N. - means unaffected nature of decarb. in M.A.D. - applies to test specimens after restoration only.

L.C. - Low Carbon H.C. - High Carbon

object was to permit any high carbon concentration at the surface to diffuse inwardly and at the same time reduce the quantity of nascent carbon supply being absorbed at the surface. At the end of the 6 hour restoration period at temperature, the furnace was shut down and furnace bell removed, and the natural gas also was shut off completely at this time. The charge was cooled to 680°F. and the inner cover was lifted for the purpose of removing the 3 test pieces of C-1038 material which in this case received a carbon restoration treatment but no spheroidizing anneal as the whole of the charge. The purpose of this was to compare the carbon content of restoration by chemical analysis and microscopic examination with the test pieces from the coils after spheroidization. This would indicate if a loss or gain in carbon content takes place with a reduced, natural gas flow at the lower spheroidizing temperature and cycle, and how carbon distribution and penetration are affected. For results obtained on both these treatments refer to the general data sheet.

* * *

FOR the spheroidizing cycle of this charge, the load was immediately covered with the inner cover and refilling of base oil seal. The inner cover was then purged free of air for about 2¼ hours with nitrogen gas and after the purge, the furnace was placed over the inner cover and lighted up to carry on the spheroidizing treatment. Natural gas to provide carbon support to prevent decarburization was turned in at a flow rate of 12 C. F. H. or 8.6% when the steel was at 940°F. This flow rate was maintained until the completion of the spheroidizing cycle and to the time when the charge had slow furnace cooled to 1150°F.

* * *

IN order to obtain perfect results in diffusing higher carbon from the extreme surface of the steel, it is necessary that the carbon potential of the carburizing gas be in exact equilibrium with that of the carbon content of the steel, that is, the carbon content desired at the surface, which is also the content at the core section.

* * *

IF he carbon potential of the carburizing gas should be too low to maintain carbon equilibrium, then decarburization or carbon loss outwardly instead of diffusion inwardly will take place. This will result in slightly lower carbon content at the extreme surface, though not decarburized to the extent where free ferrite would exist. From this explanation it can be seen that a very accurate and close control of carbon potential is necessary in order to obtain perfect results. To obtain the accurate carbon potential required, it is necessary for the carrier gas, which is the larger volume, to be consistent in dew point or water vapor content so that the proper ratios of H_2:H_2O and H_2:CH_4 are maintained with a consistent flow rate of hydrocarbon gas, in order to maintain a consistent and uniform carburizing activity.

* * *

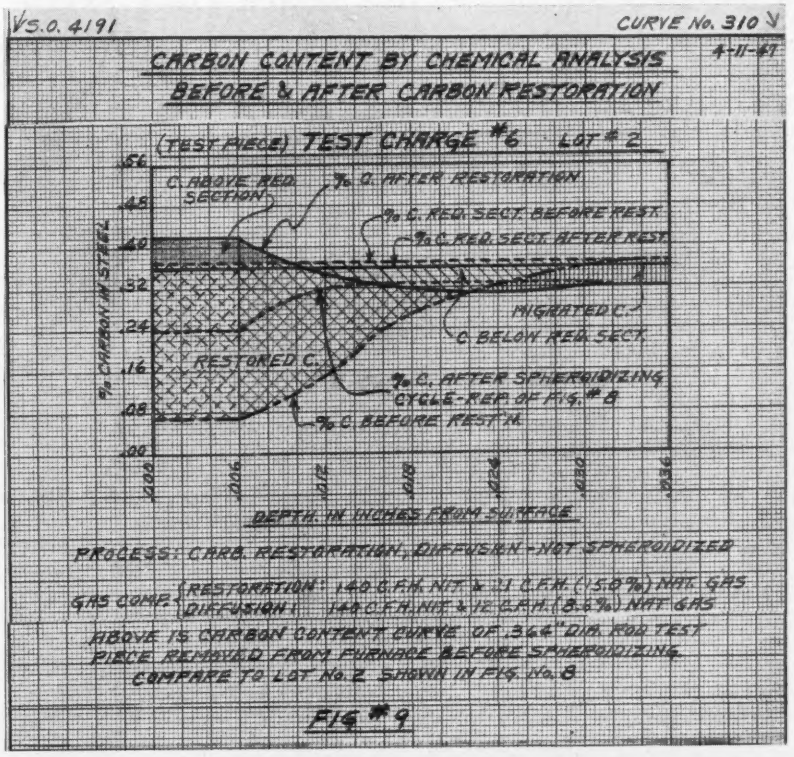
Test Charge #7

THIS test charge consisted of Charge #5 re-run with the objective of lowering the high carbon at the extreme surface of the rods. While this was run through both a restoration and spheroidizing cycle, it should be considered a diffusion cycle with steel temperature taken to 1550°F. to accelerate the rate of diffusion, the time at temperature being 3½ hours. The material after this diffusion period was again put through a spheroidizing cycle of 4 hour soak at 1300°F. and slow cooled to 1150°F. For the first part of this restoration or diffusion cycle, natural gas was admitted at a flow rate of 16 C. F. H. or 11.4% at which time the steel was 1180°F. This flow rate was later reduced to 15 C. F. H. or 10.7% after the steel had been at temperature for one hour.

* * *

THE carbon content of the test taken from the center coil had increased from .44 to .49% at the .006" depth and the carbon content of tests from the top coil decreased from .61 to .47% at the .006" depth. Referring to the general data sheet, it is indicated that in the center

(*Please turn to page* 719)


VS.O. 4191
CURVE No. 310
4-11-47
CARBON CONTENT BY CHEMICAL ANALYSIS
BEFORE & AFTER CARBON RESTORATION
(TEST PIECE) TEST CHARGE #6 LOT # 2
% CARBON IN STEEL
.56
.48
.40
.32
.24
.16
.08
.00
C. ABOVE RED. SECTION
% C. AFTER RESTORATION
% C. RED. SECT. BEFORE REST.
% C. RED. SECT. AFTER REST.
MIGRATED C.
C. BELOW RED. SECT.
RESTORED C.
% C. AFTER SPHEROIDIZING CYCLE - REP. OF FIG. #8
% C. BEFORE REST'N.
.006
.012
.018
.024
.030
.364
DEPTH IN INCHES FROM SURFACE
PROCESS: CARB. RESTORATION, DIFFUSION - NOT SPHEROIDIZED
GAS COMP. {RESTORATION: 140 C.F.H. NIT. & 11 C.F.H. (7.8%) NAT. GAS
DIFFUSION: 140 C.F.H. NIT. & 12 C.F.H. (8.6%) NAT. GAS
ABOVE IS CARBON CONTENT CURVE OF .364" DIA. ROD TEST PIECE REMOVED FROM FURNACE BEFORE SPHEROIDIZING
COMPARE TO LOT No. 2 SHOWN IN FIG. No. 8
FIG # 9

LABOR RELATIONS

by John B. Stone,

Washington, D. C.

The sixteenth of a series of articles on the subject, with particular reference to problems of the wire and wire products industry. The author is a noted authority on the subject.

DEEP changes in the organizational structure of the American labor movement which may have a direct effect upon relations between workers and management in the wire and wire products field are taking place almost every week this year.

* * *

THEY are happening little by little and attract scant notice but men familiar with labor problems believe that they add up to the most fluid state labor has been in for years.

* * *

EXAMPLES include the successful tactics of right wing unions such as the shipbuilding workers in pulling large segments of organizations away from unions dominated by left wing elements in the same federation.

* * *

THE shipbuilding workers, for instance, have gained many members from the Mine Mill and Smelter Workers in Connecticut and other New England States. The Automobile workers under Walter Reuther have won members away from the United Electrical Workers and the Farm Equipment Workers in the midwest.

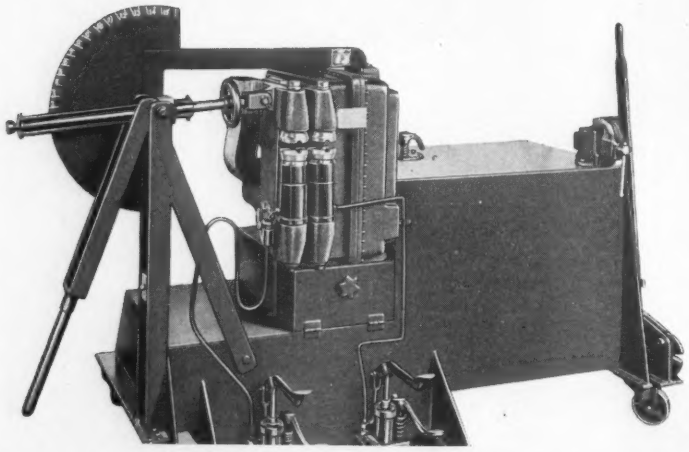
BUT even more important developments are following in the wake of these successful raiding parties. John Green, president of the shipbuilding union which gained so many members away from Mine Mill and Smelter has started a new venture entirely among public workers. With the apparent blessing of the headquarters of CIO he has started a dual union intended to run the left wing United Public Workers out of business. Obviously if he succeeds in this he can take on the Office and Professional Workers who are also under leftish leaders.

* * *

IN itself, of course, this has little significance for wire and wire

MICROMETER PRECISION MICRO WELD TRADE MARK REG. U. S. PAT OFF.

MODEL L-3 MICRO-WELD BUTT WELDER



This type welder is available in three Models (L-1) (L-2) (L-3) for welding COPPER Rods and other non-ferrous metals ranging in size from 5/16" to 7/8" diameter.

The illustration shows the Model L-3 MICRO-WELD Butt welder, equipped with foot operated hydraulic clamping mechanism, radius grooved welding dies and die shoes, and with a single control lever for the spacing operation, and contacting the welding switch.

Welders can be furnished on stationary base, or mounted on 4-wheel truck.

MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE,
CHICAGO 6, ILL.
Telephone: STATE 7459

products manufacturers since the clerical help orginized in these unions is a minor matter.

* * *

BUT if the tactic continues to succeed the manufacturer can expect major changes in some of the biggest unions in the country and their attitudes in collective bargaining.

* * *

PHIL Murray, head of the CIO is taking a steadily more menacing stand against the few left wing industrial union councils which remain. You can expect these to be broken up within the next year at the latest.

* * *

THERE are many serious students of the labor movement here who believe the left wing unions will fight back with more force than they have in the past. It is believed likely that if Murray continues his practice the United Electrical Workers, the Farm Equipment Workers, Mine Mill and Smelter Workers and other left wing unions may break out of the CIO entirely.

* * *

THAT brings up the question of John L. Lewis and his powerful United Mine Workers which he has taken out of the American Federation of Labor.

* * *

LEWIS' quarrels with the Government have cost him and his union many millions of dollars. But they have left little doubt in the minds of rank and file union members everywhere that Lewis is their champion.

* * *

ADD to this Lewis' tremendous success in getting fat wage increases for most of the soft coal miners and all of the diggers of hard coal and you have the makings of a new leadership for dissatisfied elements within the CIO and the AFL.

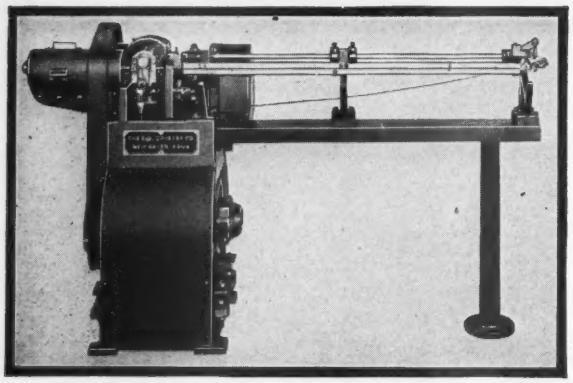
* * *

IN other words, it is believed here that though Murray may continue to "clean out" the left wing elements in the CIO and the old style leaders of the AFL will continue to hold their organizational positions, Lewis or someone like him, may soon emerge as a militant leader of a new federation taking

Keystone's new Galvanized MB Wire offers improved corrosion resistance. It gives added life and strength to mechanical springs subject to rust and corrosion. This is due to Keystone's unique method of galvanizing the wire **before** it is cold-drawn. The drawing process smooths and hardens the galvanized finish, increasing its lasting qualities remarkably. Other advantages are its lustre-bright, shiny smooth finish . . . even, uniform temper . . . and high tensile strength.

Whatever your industrial wire problem might be, Keystone's wire specialists can help solve them for you. You are welcome to call on them at any time.

KEYSTONE STEEL & WIRE COMPANY
PEORIA 7, ILLINOIS



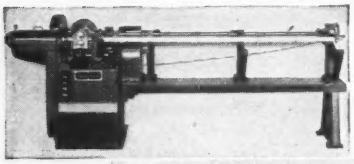
SHUSTER WIRE STRAIGHTENER TYPE A
Wire Capacity 1/32 – 1/16" Diameter

Faster Cutting Speeds
GREATER PRODUCTION!

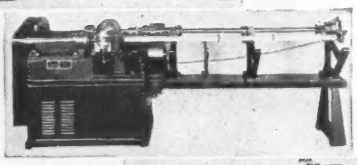
Outstanding Features —

Almost continuous wire travel
Lightning cut-off assures square-cut ends
High speed, direct driven 5-die straightening flier
Quiet, highly efficient V-belt motor drive
Ball and roller bearings throughout
Extremely rigid construction
Fully guaranteed as to material and workmanship.

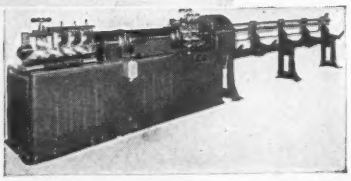
Descriptive folder on request.



Type 1A
1/16" – 3/16"
Dia.



Type 2A
1/8" - 1/4"
Dia.



Type 3A
3/16" - 3/8" Dia.

Type 4A (not shown)
3/8" - 5/8" Dia.

THE F. B. SHUSTER MFG. CO., INC.

3102 Mill River Street
New Haven, Conn.

SHUSTER SINCE 1866
Automatic WIRE STRAIGHTENING AND CUTTING MACHINES

in dissatisfied elements from both the other federations and including some big independents like the Machinists.

* * *

TO the manufacturer this new development may very well mean new jurisdictional squabbles in which he gets the brunt of the trouble. It may mean also a new less "reasonable" leadership for many of the unions with which wire and wire products manufacturers deal.

* * *

THERE is no question but that a new federation would adopt, on the economic front at least, a much more leftish approach than is used either by Murray or the AFL leadership. And unions such as United Electrical Workers, Mine Mill and Smelter Workers and other left wing organizations now in the CIO would have a freer hand to go their own way. They would not be held back, as they often are now, by councils of caution from the top leadership of the CIO.

* * *

Rhodium Plating Increasingly Popular

DURING the Industrial Finishing Exposition, held in Atlantic City's Municipal Auditorium, June 28 - July 1, International Nickel's exhibit included a diversified collection of end products finished in rhodium. Clasified as a "platinum-group" metal, rhodium possesses greater whiteness and reflectivity than its more abundant and better known sister metals, platinum and palladium. Since rhodium is chemically inert, extremely hard and heat-resistant, it is an ideal metal for surface finishing. Although rare and costly, the simplicity of plating operations, plus its ability to do the job with a remarkably thin deposit, brings unit costs into reasonable ranges.

* * *

HERETOFORE confined to jewelry, instrument reflectors and electronic applications, the display in the INCO booth shows that rhodium-plating has entered new fields.

* * *

THE platinum group metals are recovered as by products during nickel and copper refining operations of The International Nickel Company of Canada, Limited.

Outstanding Personalities of the Wire Industry

Standard Industrial Compounds Announces Some Changes in Personnel

THE following notice of interest to our readers was recently received from Mr. **C. P. Orr** of Standard Industrial Compounds, Chicago, Illinois.

* * *

CHANGES in the organization are indicated below:

Charles P. Orr — President
Floyd M. Hauger — Vice-President
M. H. Kehl — Secretary-Treasurer

* * *

THE salesman for New England and the Atlantic Coast is Charles P. Orr.

* * *

THE salesman for Pittsburgh, Buffalo and Cleveland district is **Bruce Siemon** who was formerly Superintendent of Wickwire Spencer Division of Colorado Fuel and Iron Company. He has headquarters in Pittsburgh.

* * *

THE salesman for Indiana and the South, **Leonard T. Gaiser.**

* * *

FOR Peoria, St. Louis and Kansas City district the salesman is **Earl Bowers** who has headquarters in St. Louis.

* * *

C. **R. Mehl,** who was formerly president of this company is handling the Pacific Coast and Rocky Mountain states and all sales of the company products are now made under his own name of Industrial Compounds Co., 2037 Sacramento St., Los Angeles, 21, California and 2425 Seventeenth St., San Francisco, California.

* * *

MR. Mehl was interviewed at the San Francisco Meeting of the Wire Association, June 4th, and expressed himself as very pleased with the West Coast set up, saying he felt certain of making splendid contacts there.

* * *

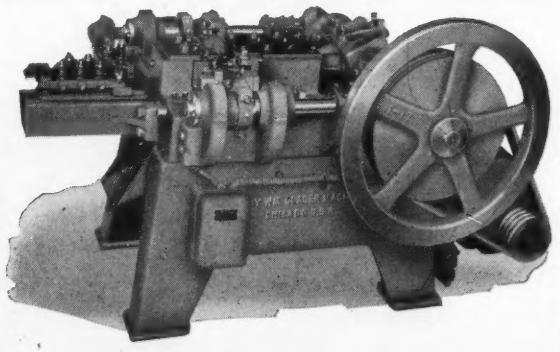
THIS company intends to expand their sales force in the near future and are also expanding the operations of the company to include all refinements of wire drawing whether ferrous or non ferrous, and all types of the various metal drawing compounds, or, you might say, anything that contains an animal or vegetable oil or combination of these.

* * *

William J. Weaver

WILLIAM J. Weaver, 61, president, Ansonia Division, Noma Electric Corp., New York, manufacturer of insulated wire and cable, died June 5, at Woodbridge, Conn.

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS
210 No. Racine Ave.
Chicago 7, Illinois
Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

Charles J. Brown

CHARLES J. Brown, superintendent of the Rankin, Pa., works of American Steel and Wire Company for 10 years prior to his retirement last March, died here last week at the age of 65 years following a long illness. Mr. Brown had been associated with the company for 38 years, chiefly as a plant executive in the Pittsburgh and Cleveland districts.

* * *

Franklin Starr Jerome

FRANKLIN Starr Jerome, president of the **Seymour Manufacturing Company,** died of a stroke in the New Haven Hospital on June 24th, 1948.

* * *

MR. Jerome became associated with the Seymour Manufacturing Company in 1918 as a vice president and in 1922 he became president, which position he held until his death.

UNDER his guidance, the Seymour Manufacturing Company grew from a small nickel silver and phosphor bronze manufacturing company to one of the largest manufacturers of nickel silver wire, rod and sheets in the industry.

* * *

MR. Jerome had many outside business interests, some of them being the presidency of the Seymour Trust Company, Seymour Products Company, Mullite Refractories Company, Rufert Chemical Company, Naugatuck Valley Company, Holt Trading Company, and treasurer of the American Crucible Company.

* * *

Dr. Barnes to Head Research for American Optical Co.

DR. R. Bowling Barnes has been elected vice-president in charge of research and development of **American Optical Co.,** with headquarters in Southbridge, Mass. For the past 12 years he has been director of the physics division of the Stamford research laboratories of American Cyanamid Co.

* * *

Chapman Transferred by Sylvania to Jamestown Plant

ARTHUR L. Chapman, plant manager for **Sylvania Electric Products, Inc.** plant, Warren, Pa., has been named to manage the company's Jamestown, N. Y. plant. Mr. Chapman has been with the company since 1933 and has been managing the Warren wire and weld plant for the past 5 years.

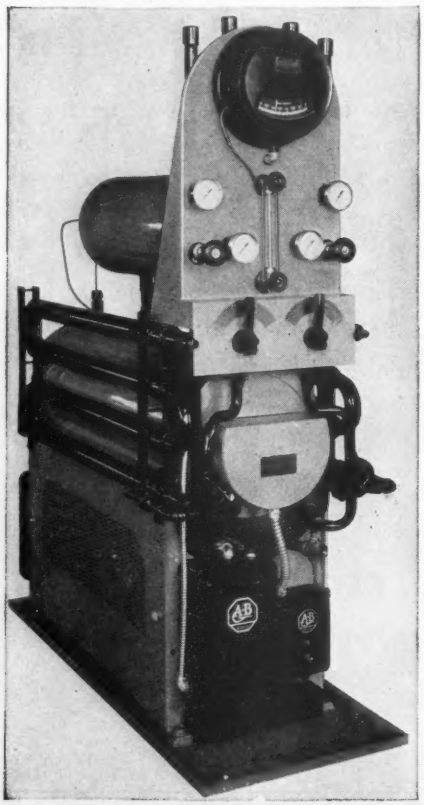
* * *

V. G. G. Nayar, Works Manager, Aluminum Industries, Ltd., Trichinopoly

WORD has been received of the appointment of **V. G. G. Nayar** as Works Manager of Aluminum Industries, Ltd., Trichinopoly.

* * *

MR. Nayar recently completed a course of study and training



THE ROYLE TEMPERATURE CONTROL UNIT

For Extrusion and Other Industrial Uses

A compact, simply operated unit designed to sustain any pre-determined temperature between 90°F and 475°F. — Hand-lever selection of desired temperature — Heat supplied — or drained — according to operational requirements — Formed piping, elimination of gaskets, and drip pans promote cleanliness — Breakdown of heat transfer oil reduced to a minimum — Three standard sizes 16KW, 32KW, 48KW — Other units with water circulation and refrigeration for operations requiring constantly maintained lower temperatures, 35°F to 200°F.

JOHN ROYLE & SONS ROYLE PATERSON N. J. 1880

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Los Angeles, Cal. — H. M. Royal, Inc. — LOgan 3261

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with the Aluminum Company of America designed to equip him for his new responsibilities.

V. G. G. Nayar, Wks. Mgr. Aluminum Industries, Ltd., Trichinopoly. * *

* * *

Jessop Steel Company Names C. A. Gordon Works Manager

CURTIS A. Gordon has been named general works manager, **Jessop Steel Co.**, Washington, Pa. Mr. Gordon formerly had been Superintendent at the Colorado Fuel & Iron Corp., Wickwire Spencer Steel Division, Buffalo, N. Y., and has had varied experience in the steel industry, being associated with the following companies: Bethlehem Steel Co., Canton Alloy Co., Donner Steel Co., Rustless Iron & Steel Co., and Crucible Steel Co. of America.

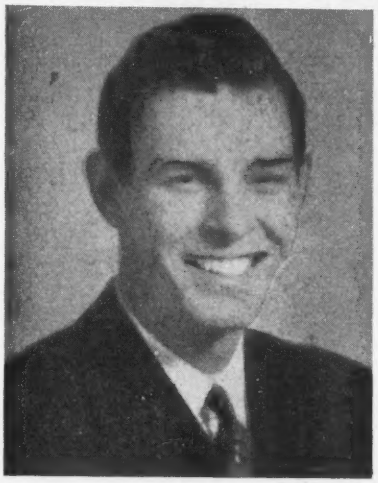
* * *

J. B. Bean Is Apex Alkali Western Division Sales Manager

J. B. Bean, now representing the Apex Alkali Products Company of Philadelphia in New York State and Canada, has been promoted to Western Division Sales Manager covering the territories of Ohio, Indiana and Western Pennsylvania.

* * *

MR. Bean brings 10 years' experience to the wire field and will now work with Apex's regular local representatives who call on wire mills and will also service his regular territory.



J. B. Bean, Western Sales Manager, Apex Alkali Products. * * * * * *

* * *

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THE WEAN EQUIPMENT CORPORATION are recognized as specialists in high-efficiency strip and wire mill equipment.

COLD ROLLING MACHINERY

For 36" Wide Material and Narrower

MILLS - REELS - SLITTERS - LEVELERS
COILERS - EDGERS - SCALE BREAKERS - SHEARS
SCRAP BALLERS - CONTINUOUS PICKLING

WIRE MILL EQUIPMENT

PATENTING, GALVANIZING AND TINNING TAKE-UP FRAMES
WIRE FLATTENING MILLS - SPOOLERS - NAIL GALVANIZING AND BLUEING EQUIPMENT - FIELD FENCE AND BARBED WIRE MACHINES

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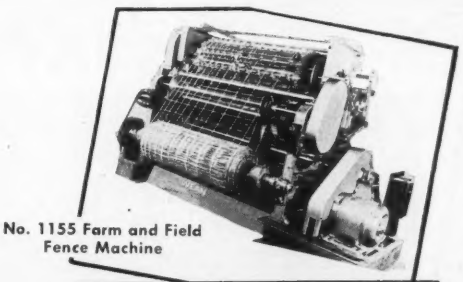
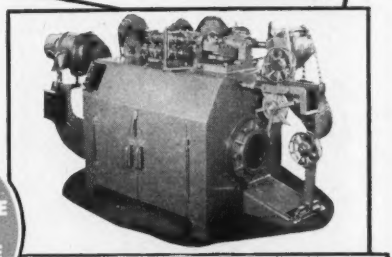
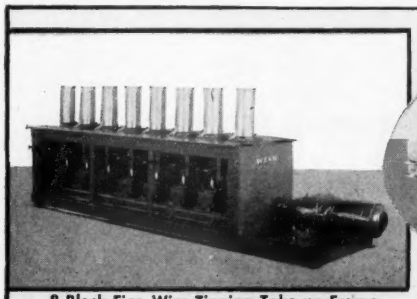


No. 1155 Farm and Field Fence Machine

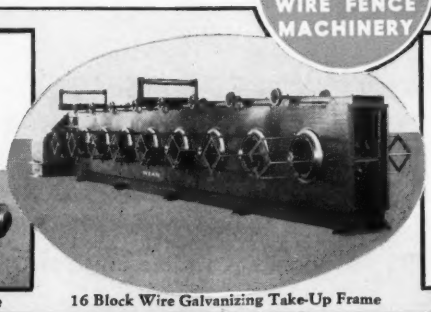


Barbed-Wire Machine

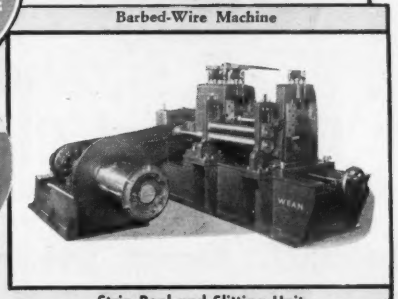
HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY



8 Block Fine Wire Tinning Take-up Frame



16 Block Wire Galvanizing Take-Up Frame



Strip Reel and Slitting Unit

Representative of British Insulated Callender's Cables Visiting U. S.

MR. **H. E. Jones** in charge of the diamond-die department of the British Insulated Callender's Cables Limited, Prescot, England, is in the United States visiting manufacturers of diamond dies.

* * *

Miss Horsey Added to Glenn L. Martin Staff

APPOINTMENT of **Eleanor Fisher Horsey** to the staff of the Chemicals Division of The Glenn L. Martin Company at Baltimore, was announced today by Robert H. Kittner, Vice President in charge of the division.

* * *

MISS Horsey will prepare technical reports and other written materials for customer information and industrial distribution on Marvinol VR-10 and other chemical products of the Martin Company. She will be assigned to the main office of the division at 501 E. Preston Street, Baltimore 2, Md. and will work with the Martin Technical Service group.

* * *

MISS Horsey has been associated with Hercules Powder Company since 1942, and was with the Borden Company prior to that time. She received her Master of Science degree in chemistry at Cornell University in 1938. She is a member of the American Chemical Society and other scientific associations.

* * *

Crabtree Representing Norton at Flint

NORMAN V. **Crabtree**, Abrasive Engineer for Norton Company, Worcester, Massachusetts, in Lansing, Michigan, has been appointed for the territory centering around Flint, Michigan. He will replace Harlan T. Pierpont who is being transferred to Worcester to become Sales Manager of the company's Refractories Division.

* * *

RICHARD H. **Merchant**, formerly Field Engineer in the Detroit area, is appointed Abrasive Engineer to take over the district recently covered by Mr. Crabtree.

* * *

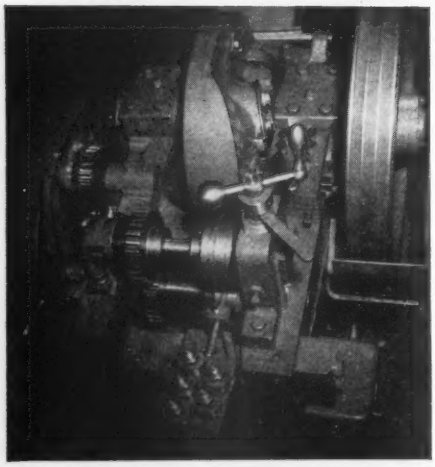
THESE appointments became effective July 1, 1948.

* * *

D. J. Hedgcock Succeeds T. E. Bowen

D. **J. Hedgecock** has been appointed engineering specialist in the Wire, Rod, Bar & Structural Division, Reynolds Metals Co., Louisville. He succeeds **T. E. Bowen**, resigned. In his new position, Mr. Hedgecock will devote his efforts principally to the promotion of new uses for aluminum in the structural engineering field. He has been serving for the last year as sales engineer, specializing on the Reynolds Alumi-Drome, and previously was chief engineer and acting plant manager at Reynolds' Newark, O., plant.

1000 STAPLES PER MINUTE!!!



Top View, showing Fly Wheel and Gears

FENCE STAPLES — POULTRY NETTING STAPLES — DOUBLE POINTED TACKS (WIRE CLOTH TACKS)

Fastest Staple Cutter Ever Made — Makes Two Complete Staples at each revolution — Compact, Easily Adjustable, Efficient.

48 Different Leg Lengths, Gauges 9 through 18

Can Be Made With

HUMPHREY RAPID STAPLE CUTTER

Early Deliveries of Belt or Motor Drive Machines Now Possible. Send for complete details and prices.

Manufactured Exclusively For

REED and RICHARDS TRANSATLANTIC, INC.

CHANIN BLDG., 122 EAST 42nd ST., NEW YORK 17, N. Y., U.S.A.

REG. CABLE ADD.. "LOUREED, NEW YORK".

Also Bale Tie Machines, producing single loop, round or oval ties, 2000 per hour; 3 to 16 ft.

Moore Joins Hoskins Sales Manager

J. W. Moore became Sales Manager of Hoskins Manufacturing Company, Detroit, recently. In that position he succeeds W. D. Little who retired April 1, 1948.

* * *

MR. Moore came up from the ranks at Hoskins. He started as Shipping Clerk, became Manager of the Order Department, and then joined the selling staff. He has been District Manager in Pittsburgh, followed by many years of responsibility for sales in the districts of Michigan, Ohio, Kentucky, and Tennessee.

* * *

New Product Dissolves Sludge, Gum in Hydraulic Systems

A new sludge and gum solvent has been developed by the Swan-Finch Oil Corporation, 30 Rockefeller Plaza, New York City, for the users of hydraulic equipment. The new product, known as Hydro-Solv "A", can be added to regular hydraulic oils to remedy any sluggish operation caused by contaminants.

* * *

AFTER the recommended 100-150 working hours allowed for the treatment, the system should be completely drained and new oil put in. Gum and sludge, either in solution or suspension, is removed with the dirty oil. There is no necessity of cleaning the system after using Hydro-Solv "A". Simply refill and resume production.

* * *

BY using Hydro-Solv "A" many advantages are obtained: a clean hydraulic system; long pump and valve life; freedom from jerky feeds, chatter and vibration; long life of fluid; smoother operation and better control; reduced machine down-time and production loss; minimum labor for maintenance.

* * *

NEW literature is available from Swan-Finch on this product.

THE 1948 ANNUAL CONVENTION

will be held in Pittsburgh, Pa., at the

WILLIAM PENN HOTEL

October 18th through the 22nd.

Please note that the Convention will occupy five full days this year, instead of four, as heretofore. Enter these dates on your calendar now and plan to attend the big meeting

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A Review of Recent Wire Patents

No. 2,442,364 GARMENT BAG SUPPORTING FRAME, patented June 1, 1948 by Marie J. Kraft, Three Oaks, Mich., assignor to the Warren Featherbone Co., Three Oaks, Mich., a corporation of Mich.

More specifically this device, which is constructed wholly of wire, is adapted to support a number of hangers as well as the garment bag.

* * *

No. 2,442,713, WIRE FLEXURE TESTING APPARATUS, patented June 1, 1948 by Ralph W. Shartle, Clayton, Mo., assignor to Wagner Electric Corporation, St. Louis, Mo., a corporation of Delaware.

In order to test the bending resistance of wire, the inventor provides a pivotally supported beam for applying bending strain to a wire, a fixed curved surface located in the path through which the bending strain applied by the beam tends to move the wire whereby that part of the wire brought into contact with this surface will be bent to conform therewith, a weight for actuating the beam in a strain applying direction and longitudinally adjustable on the beam, a counterweight including an adjustable weight element for balancing the beam when the actuating weight element is in a selected position and also including a second weight element, and a device for retarding the motion of said second weight element.

* * *

No. 2,442.776, RADIO FREQUENCY CHOKE COIL, patented June 8, 1948 by Thomas A. Newkirk, Fairfield, Ohio.

This coil comprises a continuous conductor wound in spiral and conical form, every helix thereof being longitudinally spaced from all adjacent helices, the helices progressively increasing gradually and regularly in diameter from one end to the other and the longitudinal spacing between successive helices decreasing gradually and regularly in the same direction, this coil being provided with a complete and continuous enclosing insulating and stiffening layer.

* * *

No. 2,442,785, SIGNAL-TRANSMITTING CABLE INSENSITIVE TO EXPLOSION PRESSURE PULSES, patented June 8, 1948 by Maurice M. Shapiro and Bertram Stiller, Cabin John, Maryland.

The cable comprises a pliable low resistance central conductor wire, a flexible insulative fiber glass covering snugly surrounding the central conductor, an annealed copper tube surrounding the covering and providing a small clearance space therearound, this tube having an elastic limit sufficiently high to maintain its original contour when subjected to underwater pressure pulses generated by detonation of high explosives, and a wax filler completely occupying the space, all the elements of the cable being materials which show no piezoelectric effect upon subjection of the cable to an underwater explosion.

* * *

No. 2,443,887, WAX RESIN COMPOSITIONS AND CONDUCTORS INSULATED THEREWITH, patented June 22, 1948 by George J. Bohrer, Troy, N. Y., assignor to General Electric Company, a corporation of New York.

About the conductor is an insulation comprising premeable material (asbestos) coated and at least partly impregnated with a composition comprising a chlorine-containing resin and a chlorine-containing wax.

* * *

No. 2,443,914, METHOD OF AND APPARATUS FOR FORMING ARTICLES, patented June 22, 1948 by Vincent G. Jarman, Watchung, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

For forming a wire strand article, such as a filament for a vacuum tube, the inventor proceeds to connect a part of a strand intermediate portions thereof, to receiving portion of a mandrel rotating the mandrel about its axis while moving the mandrel longitudinally of its axis to form double spiral of given length of the

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

ADVANTAGES WORTH CONSIDERING

When in the market for cable lacquers, insulating finishes, or impregnating compounds, consult us and have at your command:

1. SPECIALIZED RESEARCH EXPERIENCE
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STANDARD VARNISH WORKS

Engineers of Product Finishes

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strand portions, inserting a pin thru the pin aperture of the mandrel, and forming legs for the convolutions by bending the strand portions about the pin and extending them longitudinally of the mandrel.

* * *

No. 2,443,974, INSULATED ELECTRICAL CABLE, patented June 22, 1948 by Ralph W. Atkinson, Westfield, N. J., assignor to General Cable Corporation, New York, N. Y., a corporation of New Jersey.

This cable is said to have a power factor at 60 cycles of less than 1% at temperatures up to 100°C., practically uniform radial power factor in the insulation from the conductor to the sheath, high insulation resistance, high stability against oxidation when heated, and a low rate of deterioration when subjected to electrical stress.

* * *

No. 2,443,986, WINDING MACHINE, patented June 22, 1948 by John W. Little, Birmingham, Ala., assignor to Goslin-Birmingham Manufacturing Company, Inc., a corporation of Alabama.

The machine is adapted for winding retaining wire about the rotary drum of a continuous filter and comprises a feed screw mounted alongside the drum, a winding wheel mounted to travel along the feed screw and having a recess in its face for receiving the retaining wire, a flexible tension band partially surrounding the wheel and bearing against the wire in the recess, a holder for securing one end of the band, a weighted lever for pulling the band about the wheel and a hook on the other end of the band detachably engaging the lever.

* * *

No. 2,444,001, APPARATUS FOR MAKING TRANSMISSION CABLES, patented June 22, 1948 by Charles A. Arens, Chicago, Ill., assignor to Arens Controls, Inc., Chicago, Ill., a corporation of Illinois.

More narrowly, the apparatus is for forming the composite inner structure of a mechanical transmission cable and comprises a supply source for core wire, a take-off, a guide for the core wire from the supply source through a forming station to the take-off along a predetermined path of travel, the guide comprising a rotatable hollow sleeve through which the core wire is adapted to be propelled, a winding head carried by this sleeve, a supply source for coil wire carried with the winding head, a number of relatively angularly disposed pulleys for guiding the coil wire from the last named supply source to the forming station, and a coiler at the forming station for coiling the coil wire around the core wire in predetermined pitch relationship.

* * *

No. 2,444,306, MACHINE FOR MAKING CONTINUOUS RODS, patented June 29, 1948 by Desmond Walter Molins, London, England, assignor to Molins Machine Company, Limited, London, England.

The invention resides in a deflector and cutter for the continuous rod as it is formed.

* * *

No. 2,444,322, WIRE HATRACK, patented June 29, 1948 by Eric J. Ajax, Minneapolis, Minn.

This device for supporting at hat upside down is constructed almost wholly of wire.

* * *

No. 2,442,948, APPARATUS FOR MAKING CONVOLUTE WOUND TUBING, patented June 8, 1948 by Boris Bogoslowsky, Jackson Heights, N. Y.

Apparatus for making convolute wound tubing from sheet material comprising, a continuously moving conveyor, a plurality of mandrels removably mounted on said conveyor and freely rotatable thereon, means for winding and heat sealing convolute wound tubings on successive mandrels, and a printing plate extending in a direction parallel to one stretch of said conveyor at a level such that said mandrels engage said plate along said stretch and are rolled along said plate by the continuous movement of said conveyor.

* * *

SEND IN
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for the
1948 WIRE BUYERS GUIDE

MOSSBERG PRESSED STEEL CORP.

Greater service from a new All Welded Steel Take Off Reel designed to meet present day requirements.

Usual maintenance expense eliminated by adoption of this new design wherein all parts are welded into one homogeneous unit.

Reel sides are embossed with radial reinforcing ribs for increased rigidity with rolled edges for additional strength and to facilitate handling.

Complete line of spools and reels for both processing and shipping all kinds of bare and insulated wires and cables. (Send for Catalogue W-104)

All Welded Steel Take Off Reel

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Pressed Steel Corp.
18 WEST STREET
ATTLEBORO, MASSACHUSETTS, U. S. A.

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

Drives for Automatic Speed and Tension Control in Wire Processing Equipment

(*Continued from page 679*)

THE amount of weight attached to the dancer roll sheave can be varied so that any desired coiling tension can be obtained.

* * *

Wire Drawing Equipment Application — Electrical Control

ONE of the most interesting applications of electrical speed and tension control in connection with wire drawing equipment is found in the multiple motor continuous wire drawing machine. This is a tandem machine with a series of motor driven capstans, usually running from four to as many as six or seven, each capstan drawing the wire in turn through its respective die. In analyzing the control requirements for this application, we see that individual speed control must be provided for each capstan motor so as to compensate for variations in drafting. In addition, all of the motors must be controlled simultaneously for acceleration, deceleration, and fast stopping. These requirements are sometimes further complicated by the fact that the first capstan is often double-decked so that either one or two

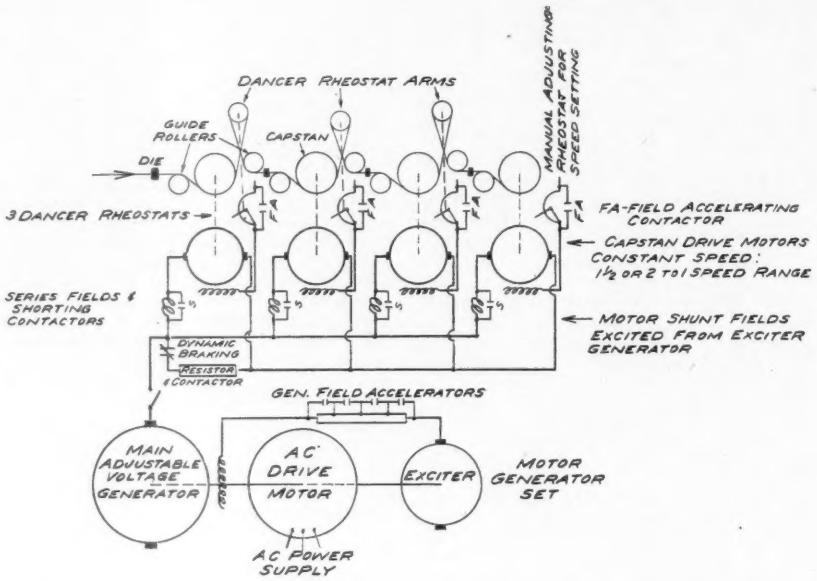

Fig. 10. — Schematic single line diagram. — Variable voltage electrical drive for multiple motor continuous wire drawing machine.

* * * * * *

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SPECIAL PURPOSE WET AND DRY DRAWING SOAPS
COMPOUNDS FOR FERROUS AND NON-FERROUS ALLOYS
BRASS • BRONZE • COPPER • ALLOYS
STAINLESS STEELS • TOOL STEELS
LOW CARBON • HIGH CARBON
for
ROPE WIRE
MUSIC WIRE
SCREEN CLOTH
NAIL WIRE
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SPRING WIRE
COAT HANGER WIRE
OTHER TYPES OF WIRE
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OR
PHONE
HOMER, N. Y.
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MANUFACTURERS OF
WIRE, TUBING, STAMPING, DEEP DRAWING SOAPS AND COMPOUNDS
OUR ENGINEERS WILL BE GLAD TO COOPERATE WITH YOU.

dies may be used with it, and also by the fact that the last spindle is frequently arranged to use several different sizes of finishing blocks.

* * *

THE most common electrical system used to meet these requirements uses adjustable speed D-C motors for driving the capstans, these motors being powered from a constant potential source. Figure 9 is a schematic diagram of this system. A dancer roll rheostat, controlled by a tension arm, is provided for each motor with the exception of the last one, so as to regulate the speed of the individual capstan motors by field control.

* * *

FOR best results, matched motors are used, specially designed to provide the necessary stability and speed range. The motors are usually all of the same horsepower, although a larger motor is sometimes used for the first capstan if it is double-decked. Sufficient speed range by field control must be provided for the speed range of the machine, plus the additional range required for stability and field forcing and for the variations in drafting. If several sizes of finishing blocks are used, the motor driving the finishing block must have additional speed range to compensate for the variation in diameter. Since the speed range by field control of a standard D-C motor is usually limited to 4:1, it is apparent from the above requirements that a limitation is placed on the speed range of the machine.

* * *

IT is the function of the remaining electrical control equipment to control all of the motors simultaneously for starting, acceleration, deceleration, and stopping. Smooth acceleration is obtained by using a relatively large number of accelerating contactors, and stopping is obtained by dynamic braking.

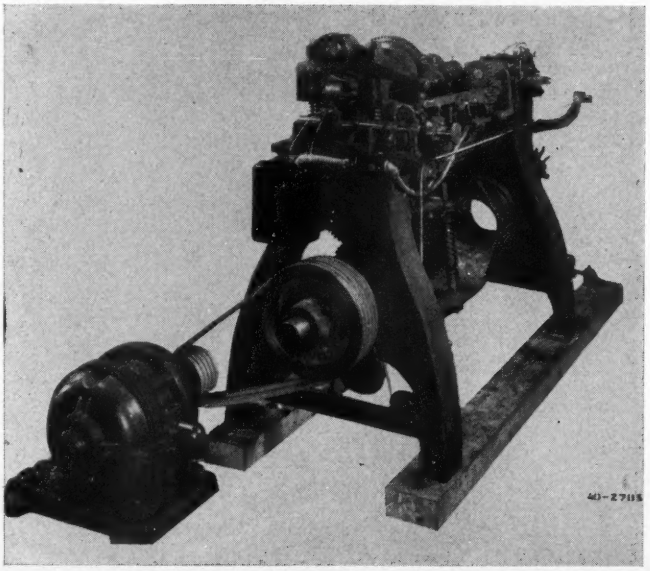
* * *

IN order to avoid the limitation on speed range imposed by the constant potential system of control, applications of variable voltage control to continuous multi-motor wire drawing machines have been developed and are proving increasingly popular. With the variable voltage system, the D-C capstan motors receive their power from a separate D-C generator rather than from the shop line. The speed of all the motors can thus be varied simultaneously by controlling the voltage supplied by the generator. Figure 10 shows a schematic diagram for the variable voltage system.

* * *

THE additional speed range obtained with this arrangement gives greatly increased flexibility to the equipment and makes it possible to operate at the most desirable drawing speed over a wide range of products. In addition, improved acceleration, deceleration, and braking are obtained together with a more stable jogging condition.

GLADER BARBED WIRE MACHINE



Used Throughout the World

Machine can make 2-point or 4-point Barbed Wire. Both types can be made on the Glader Combination Machine. Changeover requires about 15 minutes.

Maximum production — One man can operate two machines easily, efficiently.

Glader Barbed Wire Machine also makes 2-strand plain cable wire, without barbs.

Write for Export Bulletin No. 22 giving Prices and full details covering GLADER Barbed Wire Machines and GLADER Wire Nail Machines.

EXPORT DEPARTMENT, WM. GLADER MACHINE WORKS

122 East 42nd Street - New York 17, N. Y., U. S. A.

FROM the above, it is seen that the controlling element for automatic speed control on the multiple motor continuous wire drawing machine is a dancer roll or other mechanical means for operating the field rheostat of the capstan motor.

END OF PART I

Part II, Mechanical and Hydraulic Drives, together with the conclusions reached, will follow in the next issue.

* * *

Foreign Notes

THE German wire industry continues hopelessly underequipped. The following data has been released by the Federation of iron, steel and metal products manufacturers of Verlbert, Theineland: Of 100 manufacturers the following percentages were reported: a = total destruction of machinery; b = partial up to 50% not yet replaced, c = 50-75% not yet replaced; d = less than 25%; e = without any damages. This means that a = is laying idle and the rest working in proportion to the existing machinery.

wood screw	makers,	a =	15,	b =	30,	c =	40,	d =	25,	e = 0
wire netting	"	a =	10	b =	45	c =	10	d =	5	e = 30
bolt and nut	"	a =	5	b =	35	c =	30	d =	15	e = 15
wire nails	"	a =	20	b =	20	c =	25	d =	10	e = 25
fencing wire	"	a =	15	b =	15	c =	40	d =	15	e = 15

NOT one out of the 100 has been able to get a new machine for his production since May 1945.

* * *

THE raw material distribution in April 1948 was only 67% of the requirements.

* * *

THE industry engaged in April 1948 77% of the workmen, which were on the payroll in May 1945. The output was however only 37%. The reasons for this phenomenon are well known. Starvation food ration, absenteeism due to efforts to procure food, and more hand work, instead of machinery work.

THE new Bristish-Spanish trade agreement included wire products. Spain will supply to Great Britain 1100 tons of copper rods and receive 2600 tons of wire products, mainly thin wires, thinner than 20 G, tacks, wire ropes of high quality, musical wire, flower wire and wood screws.

* * *

THE French-Spanish trade agreement includes exportation of lead, zinc and tin to France and the supply of approximately 1,000 tons of various wire products to Spain, mainly for use in the electrical fields.

* * *

THE Swedish-Spanish Trade agreement includes 1500 tons of high carbon rods from Sweden to Spain and 500 tons of cables and other electrical products.

The SPECIALISTS in
Wire-Straightening and Wire-Cutting!

Diameter Range — 1/16" to .005"

PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

ASK ABOUT OUR UNEXCELLED FACILITIES FOR CLEANING AND POINTING WIRE ALREADY STRAIGHTENED AND CUT.

ALL TYPES OF WIRE...

- Nickel
- Stainless Steel
- Bronze
- Brass
- Copper
- Alloy Wire
- Music Wire
- Tag Wire
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ON the export market the situation remains rather quiet. Some demand had been noted in the second half of May from Near East countries, including Egypt and Pakistan. The African Colonies continue to buy, though in reduced quantities. The Latin American market is lifeless, except Venezuela and Mexico. The main demand is for woven wire, rice cloth, filter gauzes, insect screens and thin wire. Wire nails and fencing wire is less demanded. Prices are more or less unaltered.

* * *

A German maker who sends to Portugal 1 kilo of violin strings, (wire of fine sizes high quality), produces this 1 kg at M 4.—. If he sells it through the JEIA, he gets approximately M 3.— or 1 Mark less, than his proper costs. If he sends it in small parcels directly abroad, say to Portugal (up to 500 Grams parcels are now free), he gets for it 2 kilos of coffee, 1 kilo of sugar and a tablet of chocolate. For this parcel he obtains approximately 2300 Marks in the black market, or 400 times his proper costs. With a few kilos of his products a month he can maintain his whole factory running and stil earn enough to buy additional food in the black market. Selling through authorized channels he is condemned to close down bankrupt.

* * *

Wax Lubricant For Extruding

A new liquid wax for use as a lubricant in the manufacture of metal items by the impact extrusion process has been developed by the makers of **Johnson's Wax.** It is being marketed as Johnson's LW#20 Wax.

* * *

IN impact extrusion a waxed metal slug is placed in a die and struck a single, hard blow with a punch, causing the metal to flow out of the die and shoot up the sides of the punch to form a perfect tube. Typical articles produced by this process are collapsible tooth paste and shaving cream tubes and condenser cans.

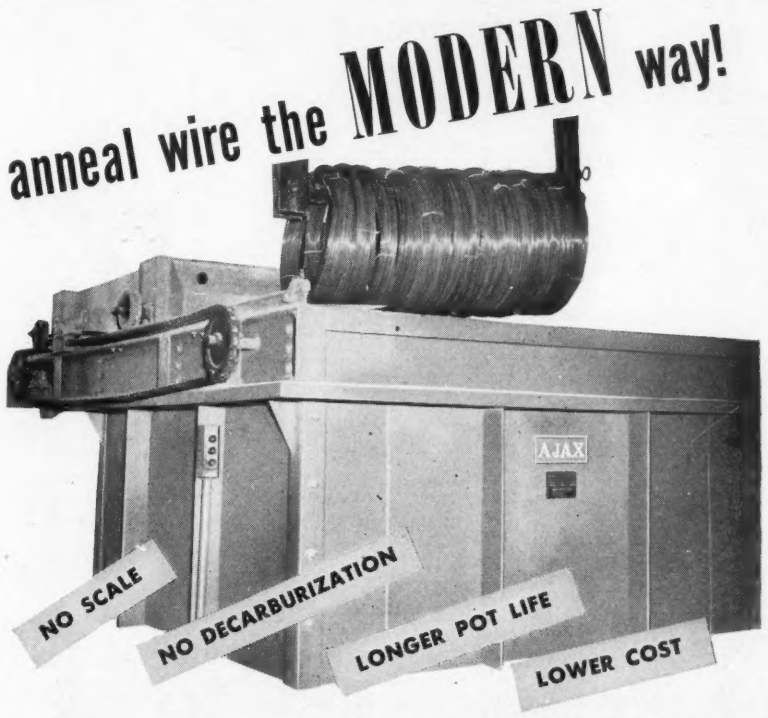
THE great heat generated in the process and the need for complete freedom of flow require an extremely efficient and rugged lubricant. Johnson's LW#20 Wax meets these requirements, giving a much more even coat than oils and tallows formerly used. It remains in place under the terrific heat and does not dissipate itself — thus cutting the number of rejects due to scoring caused by imperfect lubrication.

* * *

THIS Liquid Wax can be easily applied to slugs before extrusion by dipping or tumbling. It provides a dry finish that is easy to handle and sanitary, and will not turn rancid.

* * *

DEVELOPMENT work on this process has been done by Johnson's chemists in cooperation with metallurgists at the Edgewater, N. J., plant of the Aluminum Company of America. Further information on this Wax can be obtained by writing to Product Finishes Department, S. C. Johnson & Son, Inc., Racine, Wisconsin.



You'll save money, you'll improve efficiency along many lines with the unique Ajax Electric Salt Bath wire annealing method. It requires less floor space, less labor, less maintenance. Heating cycles average less than 20 minutes, even on difficult jobs. There is no scaling, no decarburization, no explosion hazard, none of the bothersome problems entailed with atmosphere equipment. Salt bath treating does the work faster, better, cheaper!

Ideal for annealing low- or high-carbon and stainless steel wire and rod; annealing aluminum, and copper and silver alloys; and for descaling stainless and alloy steel wire in molten salt baths.

AJAX ELECTRIC COMPANY, INC.
Frankford and Delaware Aves. · Phila. 23, Pa.
The World's Largest Manufacturer of Electric Heat Treating Furnaces Exclusively

WRITE FOR YOUR COPY!
This 72-page Ajax booklet tells the entire story of salt bath heat treatment as applied throughout modern industry. Ask for Booklet 116.

AJAX HULTGREN ELECTRIC SALT BATH FURNACE

Industrial Dust and Fume Control

EFFECTIVE industrial dust and fume control by means of exhaust systems depends upon confining or housing the source of dust or fume production as completely as possible and establishing a proper air movement through such exhaust hoods, enclosures, or housings to the exhaust piping system. This principle is being stressed in the work of the Sectional Committee on Safety Code for Exhaust Systems, Z9, representative of 24 national governmental, technical and trade organizations, which is now working on the development of a Safety Code for Exhaust Systems.

* * *

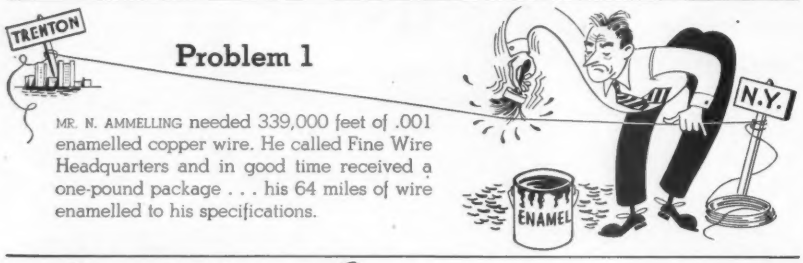
AT a recent meeting of the committee, working under the procedure of the **American Standards Association,** it was agreed and strongly advocated that manufacturers of equipment, machinery, and apparatus which in operation produces dust or fumes should provide housings or enclosures as an integral part of the original design. There is little more reason for such equipment being furnished without provisions for effective dust and fume control than there is for furnishing such equipment with unguarded gears, in the opinion of the committee. The manufacturer has intimate knowledge of the operating action of his equipment, the air currents which it may create, and the access points needed for inspection, adjustments, and maintenance. As a result, by cooperating with dust and fume control engineers he can provide effective workmanlike enclosures or housings with provision for proper exhaust system connections as an integral part of the machines. While this practice may result in some increase in the purchase price of the equipment, insofar as overall cost to the ultimate user is concerned it would prove more economical in the long run. This is due to the fact that some means of controlling fumes and dust must be provided locally after installation if they are not furnished with the equipment. Such locally added exhaust hoods, enclosures, housings, etc. are a compromise, at best, as they frequently are improperly designed and fabricated and the control results are poor. In most instances when they are provided in the field it means a "cut and try" procedure at considerable expense. In some cases this results in interference with equipment operation, adjustment, and servicing which causes such enclosures to be entirely removed and not replaced, thus resulting in effective control and poor working conditions. On the other hand, if such equipment is furnished by the manufacturer with integral, well designed enclosures and housings and is initially installed with these provisions, it is very unlikely they will be removed.

* * *

ENCLOSURES and housings designed to give proper air flow that will effectively exhaust contaminated air would assure effective, dependable control with minimum air volumes, thus simplifying and reducing the size of the exhaust system. As the initial and operating costs of exhaust systems

What's your problem?

Fine Wire? Tungsten? Molybdenum?



Problem 1

MR. N. AMMELLING needed 339,000 feet of .001 enamelled copper wire. He called Fine Wire Headquarters and in good time received a one-pound package . . . his 64 miles of wire enamelled to his specifications.

Problem 2

A customer's needs called for a material with a high tensile strength at elevated temperature. He called North American Philips and received ELMET Molybdenum which performed to his complete satisfaction . . . fulfilling every requirement.

Problem 3

MR. MUST B. PLATED, who required metal-clad wire for a specific application, phoned Fine Wire Headquarters. We supplied the base material to provide the physical characteristics desired, and plated it to meet his exacting specifications for special surface qualities.

the answer

WHY not call Fine Wire Headquarters when you have a question about fine wire? We can't do the impossible, but we can do lots of things that can bring you the right fine wire for the job.

So—when you have a problem on Fine Wire, Tungsten or Molybdenum—wire, phone or write to North American Philips, makers of **NORELCO** Fine Wires, and **ELMET** Tungsten and Molybdenum products.

NORTH AMERICAN PHILIPS COMPANY, INC.
Dept. XY-8, 100 East 42nd Street, New York 17, N. Y.
Export Representative—Philips Export Corporation
100 East 42nd Street, New York 17, N. Y.

are governed by the total air volume handled, the overall cost to industry would be reduced if enclosures and housings were furnished with the equipment.

* * *

Stainless Steel's Gains Since 1928

NEARLY twenty years have passed since stainless steel first began to be produced and distributed in the United States in significant quantities. During that time, despite the relatively high premium it has commanded over the ordinary grades of steel, stainless steel has forged steadily ahead. Its uses have developed with the growth of new and specialized demands calling for resistance to high temperatures and corrosion. More common to the layman, of course, are the applications of stainless steels in automobile trim, costume jewelry and utensils.

* * *

THE recent opening in New York City of a permanent exhibit of 30 alloy steels, sponsored by three producers of raw materials and 13 steel mills, is intended to bring the public into closer acquaintance with stainless steels, its uses and prospective possibilities. The New York exhibit, in addition to fostering the sale of stainless steel for popular application, stresses the many specialized uses in industry.

* * *

STAINLESS steel was developed independently in Germany, England and the United States at about the outbreak of World War I. Satistics in the early years are sketchy. The first authoritative production figures covered the years 1929 through 1933, when the American Iron and Steel Institute began issuing annual production statistics.

* * *

PRODUCTION of stainless steel in 1929 was reported at around 53,000 tons, rising to 60,000 tons in 1930. Output dropped to 34,000 tons in 1931 as the first pains of the depression of the early 1930's set in, with the turnout receding further to 27,000 tons in the difficult year of 1932. Recovery began in 1933, when output was estimated at 39,000 tons.

* * *

AFTER the depression, stainless steel production rose steadily, with only temporary periods of retrogression, from 56,000 tons in 1934 to about 513,000 tons in 1947. The gain, according to available statistics, was nearly tenfold from 1929 through 1947.

* * *

WITH the greater call for stainless steel developing with technological advancements in many industries, in addition to the more popular requirements, producers began to diversify the forms of stainless steel products, with the current list now fairly complete as to finishes. Now available are plates, sheets, strip, bars, light structural shapes, skelp and plain or pierced billets, wire rods, blooms and billets for forging.

* * *

TOTAL finished stainless steel production reached its highest point thus far in the year 1946, at about 310,000 tons, versus 307,000 tons last year. These figures compare with 108,923 tons in 1939 and 152,707 tons in 1940. During the

Inquiry:

Gentlemen:-

We specialize in the manufacture of low and high carbon steel wire, and are not satisfied with the wire drawing compound we are using, especially from the standpoint of stability and die life. Can you help us?

Answer: Our answer to this and similar Inquiries is the extensive research program now being conducted by NOPCO* LABORATORIES to effect improvements in NOPCO'S Wire Drawing Compounds.

These improvements include (1) changing the structure of the fats and oils in these compounds, thus enabling them to create a *stronger* bond between metal and lubricants . . . and (2) the production of more *stable* fatty compounds.

NOW IN PRODUCTION. These special research projects *supplement* rather than *supplant* NOPCO'S regular activities in the production of metal working products. NOPCO Wire Drawing Compounds are available now.

Wire Manufacturers: Perhaps we can answer your wire drawing problem. Write us.

*Reg. U.S. Pat. Off.

NOPCO CHEMICAL COMPANY, Harrison, N.J.
FORMERLY NATIONAL OIL PRODUCTS COMPANY
Branches: BOSTON • CHICAGO • CEDARTOWN, GA. • RICHMOND, CAL.

NOPCO EVOLVED THRU RESEARCH

war, stainless steel application for many wartime needs helped to push finished stainless steel production higher and higher, rising from 255,090 tons in 1941 to 304,684 tons in 1944, the last full war year.

* * *

CURRENTLY some 100,000 different articles are made from stainless steel by about 10,000 manufacturing concerns. And the stainless steel industry is working toward increased utility of its products, as exemplified by the New York exhibit.

New Plastic Screw Anchor

HOLUB Industries, Inc. Sycamore, Illinois has developed a new plastic expanding screw anchor that is made for a variety of wood screw sizes from No. 5 through No. 20, and for ¼" and 5/16" lap screws.

* * *

THESE come packed in kits containing a complete assortment, so that any size will be available. The company will be glad to furnish details on request.

* * *

Pickling wire in "RODINE" -- inhibited acid means lower pickling costs and more metal saved for drawing.

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
Granodine *
Duridine *
Alodine *
Lithoform *
Thermoil-Granodine *

RUST REMOVING AND PREVENTING
Deoxidine *
Peroline *

PICKLING ACID INHIBITORS
Rodine * ®

Chemicals for Rust Proofing Paint Bonding

American Chemical Paint Co.
TECHNIGRAM
AMBLER, PA.

Pickling Acid Inhibitors Rust Removing Preventing

To: Those Interested in Efficient Pickling

Address: Modern Cleaning Houses

RODINE*--saves metal -- controls acid attack -- minimizes over pickling and hydrogen embrittlement -- prolongs life of the acid bath -- saves acid -- holds down fumes -- facilitates scale removal. Just add a little to the sulfuric or muriatic acid bath--For better pickled surfaces--speed--economy--use "RODINE"

Send for full list of ACP metal treating chemicals--of interest to all processors of iron--steel--aluminum and copper products.

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

Sylvania Electric Making New Aluminized Steel

SYLVANIA Electric Products, Inc., is producing a new type of aluminized steel for manufacture of vacuum tubes, available in strips of varying widths or as anodes and other fabricated parts, the company announced recently.

* * *

IN vacuum tube manufacture the new material eliminates the need of carbonizing nickel-plated steel parts, provides better welding properties, cuts costs and eliminates possible transfer of carbon to cathode during the manufacture.

* * *

THE new product was developed by Sylvania's Metallurgical Research Laboratories at Bayside, L. I., in cooperation with the research laboratories of Armco Steel Corp. at Middletown, Ohio. The work was directed by **Walter E. Kingston**, manager of Sylvania laboratories, following his investigations of European technology in the field.

* * *

New Airplane Antenna Insulation

REDUCTION of static interference, increased safety from static hazards, and reduction of maintenance and installation costs are the improvements in airplane antenna systems attributed to a new method of insulation.

* * *

TENSION units, tee splices and strain insulators are now completely insulated with Du Pont polythene for its unusual dielectric qualities. The new insulation will resist a 200-kilovolt stress over a temperature range of -50°F. to 130°F.

* * *

USE of polythene insulation on the various parts of the antenna system eliminates the expensive hand-taping formerly required to insure minimum radio interference. At the same time, the insulating material resists electrostatic discharge.

* * *

AS this insulation on the various antenna parts is tough and long-wearing, replacements are in-

frequent and maintenance is simplified and inexpensive.

* * *

WIRING for the antenna system is also insulated with polythene which is extruded directly onto the solid-copperweld, 0.051 inch diameter wire. Similarly, tightly fitting insulation jackets are molded directly over the connecting parts.

* * *

THE new antenna system, distributed under the trade mark, "Anstat", is manufactured and sold by Engineering Physics Division, Frederic Flader, Inc., of North Tonawanda, New York. Polythene insulation for the antenna fittings is molded by Trimold, Inc., of Kenmore, New York.

* * *

Elgin Watch Co. Develops New Stainless Alloy

USE in various industries of the new alloy developed by the Elgin National Watch Company for its mainspring is indicated from recent experiments with the metal conducted by the Elgin Research Department.

* * *

THE alloy, Elgiloy, is said to be adaptable particularly to heavy manufacturing and metal industries, the food industry and the paper and pulp manufacturer because of its marked superiority to other stainless metals in resistance to corrosion by mineral and organic acids and the chlorides.

* * *

THIS superiority was demonstrated in extensive laboratory tests comparing the corrosion resistance of Elgiloy with 17% chromium and 18-8 molybdenum stainless steels. The tests consisted of refluxing the metal specimen totally immersed in the chemical solution for approximately 50 hours.

* * *

AT the present time the alloy is manufactured in strips up to 2½ inches in width, or as round wire. Requests for the material to use experimentally can be made to Elgin's research department, the Athenia Steel Company, Clifton, New Jersey, or the Wilbur B.

NEW – AND BETTER

The *Trauwood* PROCESS

PATENTING
TEMPERING
ANNEALING

OUTSTANDING ADVANTAGES

Higher and more uniform physical and fatigue properties.

No surface decarburization or scale.

Faster wire speeds . . . greater production.

Equipment fully automatic and easy to operate.

Control of heating and cooling cycles extremely accurate.

Thermal efficiency of the process very high.

Much finer grained structure possible.

High quenching temperatures rapidly attained.

Adaptable to high alloy and austenitic steel wire and strip (annealing of stainless).

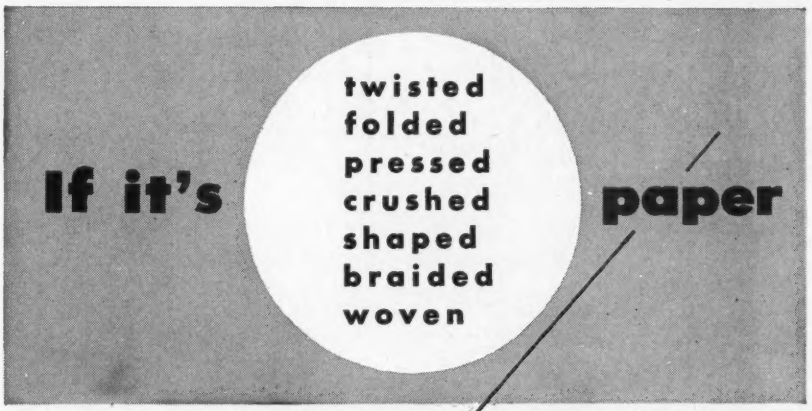
The Trauwood Process, new in principle, eliminates high temperature furnaces and lead pots with their excessive maintenance costs and low thermal efficiencies. More positive temperature control is possible and quenching is done in a RISING temperature—instead of falling, as in conventional heat treating methods. The rapid rate of heating (4 to 5 times as fast as furnace heating) increases production and uniformly produces a finer grained product with higher physical and fatigue values.

Wire and rod patented by the Trauwood Process insures easier drafting and makes heavier reductions possible. In conjunction with the Trauwood patenting equipment, pickling, coating and baking can be made continuous, eliminating expensive handling and delay, materially reducing costs as compared with ordinary methods.

Complete details of the Trauwood Process will be furnished you on request. Our engineers will help you solve your continuous wire and strip patenting, tempering, and annealing problems. Write today.

THE TRAUWOOD ENGINEERING COMPANY

15200 BROOK PARK RD., Box 2719, Westpark Station, CLEVELAND, OHIO.
British Representative:
JOHN RIGBY & SONS, LTD., LOW MOOR, BRADFORD — YORKS. ENGLAND



TWITCHELL makes it

fine, treated yarns wound 4 ends parallel for high-speed wrapping by new Abbo-sealed process will be available soon.

waxed cable-filler for 2- and 3-wire non-metallic sheath cable and ship-board cable.

wire-rope cores

braiding and wrapping yarns for electrical cable.

E. W. TWITCHELL INC.
Third & Somerset Streets, Philadelphia 33, Pa.

REELS OF WOOD

RETURNABLE and NON-RETURNABLE

Furnished assembled or knocked down, made to your specifications. Will withstand severest handling. Sturdy, strong, low in cost. Made for

CABLE, ROPE and WIRE

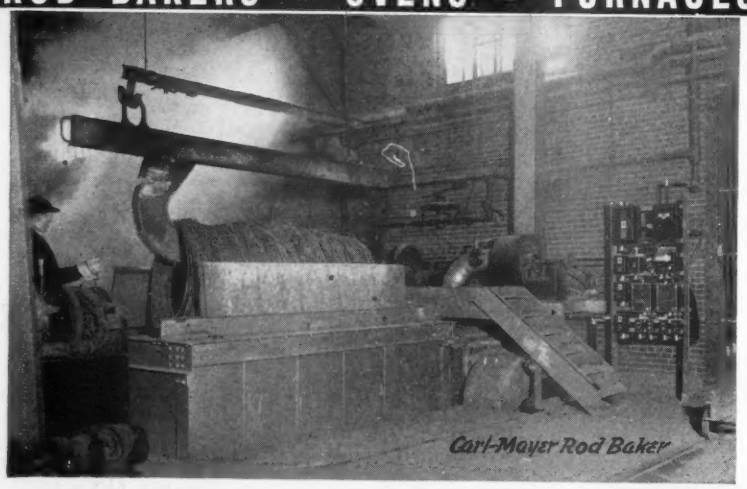
in any size from 12" to 96" in diameter.

ALSO, REEL HEADS FOR STEEL DRUMS

Send us your specifications and let us quote on costs.

BRIDGE MFG. CO., Inc.
HAZARDVILLE • CONNECTICUT

MORE PRODUCTION *with* CARL-MAYER HI-SPEED ROD BAKERS - OVENS - FURNACES



Patented
TYPICAL HI-SPEED ROD BAKER — DIRECT OR INDIRECT HEAT — ANY FUEL
WRITE for BULLETIN No. 241

Growing interest in our type of equipment is evidenced by Carl-Mayer installations for such plants as:—

American Steel & Wire Co.
Atlantic Wire Co.
Atlas Steel Co.
Atlas Tack Corp.
California Wire Cloth Corp.
Eaton Mfg. Co.
Frost Steel & Wire Co. Ltd.
Hollup Corp.
Johnson & Nephew Ltd.
Jones & Laughlin Steel Corp.
Pittsburgh Tool Steel Wire Co.
Republic Steel Corp.
Steel Co. of Canada
Wickwire Spencer Steel Div.
Page Steel & Wire Co.

THE CARL-MAYER CORPORATION
3030 EUCLID AVENUE
CLEVELAND, OHIO

Driver Company, Newark, New Jersey. The latter two companies process the alloy.

* * *

The Bittenbender Co. Scranton, Pa., Authorized Carboloy Distributor

THE increasing demand by the metal working industries in the Scranton, Pennsylvania area, for tools which will materially cut costs and increase production has led to the appointment of an authorized distributor in that area by Carboloy Company, Inc., of Detroit, Michigan. The Bittenbender Co., 126-132 Franklin Street, Scranton, Pa., is the new distributor. Established in 1909, the Bitenbender Co. has, since their founding, handled machinery and pumping equipment in addition to hardware and mill supplies.

* * *

HEADQUARTERS are maintained in Scranton. In addition to the Scranton-Wilkes-Barre area, the Bittenbender Co. will also supply users throughout Northeastern Pennsylvania. Carboloy standard tools, standard blanks, masonry drills, and diamond impregnated grinding wheel dressers will be carried in stock.

* * *

Informative New Catalog on Tabletting Machines

THE F. J. Stokes Machine Co., 6294 Tabor Road, Phila., has available a new catalog (48-T) which describes their complete line of standard, special and auxiliary tabletting machinery and equipment, and offers a fund of general information for manufacturers interested in forming industrial products by the popular compression method.

* * *

PROFUSELY illustrated, this book shows the wide range of forms and materials that can be handled with machines built by Stokes, who pioneered in the development of manufacture by tabletting. Typical installations are pictured and described.

* * *

ONE section of Stokes Catalog 48-T entitled "The Selection of a Press" is full of helpful in-

PRODUCTIMETER
PICK COUNTER
Measures
WIRE SCREEN PRODUCTION
on each of 3 shifts daily

Productimeters include units for every wire measuring requirement . . . for every type of product from woven wire screening to the lineal measurement of everything from thin wire to insulated cable. Models available for handling dimensions from .010 to 1½ inches . . . at speeds up to 5,000 feet per minute. Strong and durable . . . Productimeters are built for hard usage and long service. Their accuracy prevents losses in wire manufacturing and handling.

Productimeters eliminate "guess work" in counting . . . insure profitable operations in your plant.

Send for Catalog No. 40

DURANT MFG. COMPANY

1918 N. Buffum Street, Milwaukee 1, Wisconsin
118 Orange Street, Providence 3, R. I.

Representatives in Principal Cities

PRODUCTIMETERS
SINCE 1879 *Speedometers* OF INDUSTRY

formation for prospective users. The twenty-seven standard model machines produced by this company cover a complete list of cam, eccentric, rotary and toggle type with pressures ranging from one-half to 300 tons.

* * *

INFORMATIVE, clearly written and packed with interesting facts, this book should be helpful to those who make electrical products, machine parts, cemented carbides, porous bearings, ceramic shapes, plastic preforms and a host of products which can be processed better and more economically by the versatile tabletting method.

* * *

New Booklet Covers Products Made by G.E. Chemical Dept.

AN 18-page illustrated booklet (No. CDP-576) describing briefly the wide range of products manufactured by the General Electric Company's Chemical Department has just been issued. Products of the Company's Plastics Division, Resin and Insulation Materials Division, Metallurgy Division, and Compound Division are described together with their many industrial applications.

* * *

COPIES may be had by writing the General Electric Company, Chemical Department, 1 Plastics Avenue, Pittsfield, Mass.

* * *

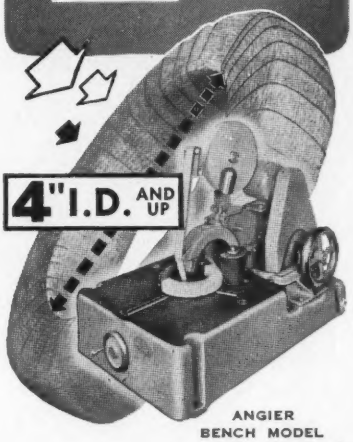
New Data on Highly Alloyed Stainless Steel

AN 8-page bulletin has just been issued on a high alloy low carbon austenitic Stainless Steel known as Durimet 20. Introduced just before the war, this alloy has proved to be markedly superior to standard 18-8 stainless steel analyses for certain severe corrosive services, especially in the handling of sulfuric acid.

* * *

IN the cast form Durimet 20 contains 29% Nickel, 20% Chromium, 1¾% molybdenum, 3½% copper, 1% silicon and 0.07% Max carbon. In the wrought form the copper and silicon contents are modified slightly.

PAYING TOO MUCH to package your SMALL coils?



ANGIER BENCH MODEL
recesses into bench

Angier's new portable bench model is the LOWEST PRICED spiral wrapping machine we have ever introduced. Adaptable to conveyor or production line operation, it is designed to *reduce the unit cost* of packaging your small coils three ways:

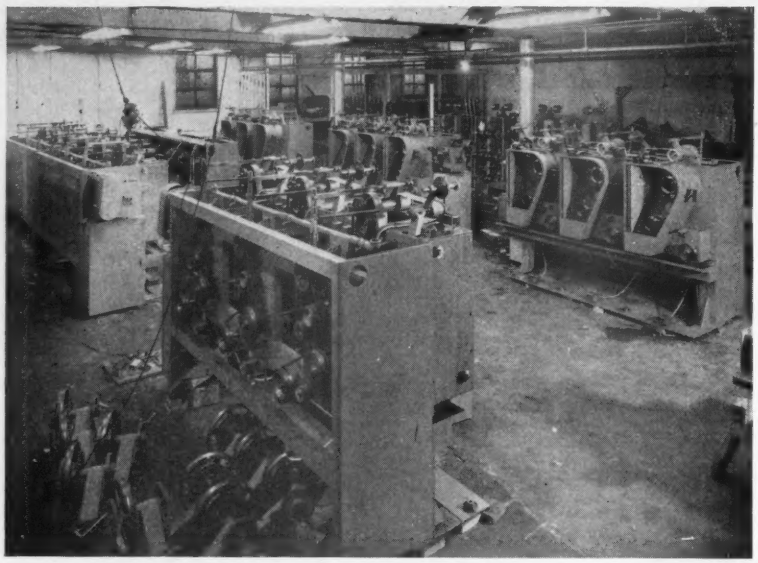
1. *Cuts Out Costly Hand Wrapping.*
2. *Cuts Need of Costly Containers.*
3. *Cuts Product Damage in Transit.*

If it's protection you want — from water, oil, or abrasion — it will cost you less to Angierize your coil wrapping now!

GET THE FACTS about Angier's complete spiral wrap service. Ask for booklet "The Better Way to Wrap Coils" or invite an Angier engineer to call.

SINCE 1895
Angier
CORPORATION
FRAMINGHAM 3 • MASSACHUSETTS

AMERICA'S FOREMOST SPIRAL WRAP ENGINEERS



Some Fine Wire Drawing Machines, with units individually motor driven, we are building on current order.

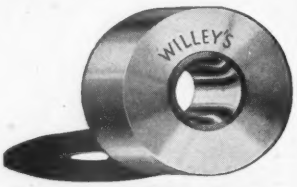
EST 1868 AIMCo INC. 1915
"American" INSULATING MACHINERY COMPANY
517 W. Huntingdon St.
Philadelphia 33, Penna., U. S. A.

Machines ball bearing mounted throughout. Can be supplied with either unit drive or gang drive.

WILLEY'S DIES LAST MUCH LONGER

SPECIFY WILLEY'S SIZING, EXTRUSION and WIRE DRAWING DIES

Pioneers in the manufacture of wire forming dies, Willey's is in position to make dies to your specifications that give superior performance, cut production costs and hold tolerances for long runs.



There are standard one-piece round dies, available from stock, in many sizes — as well as four classifications from blank and rough cored nibs to finished dies, ready to use.

WRITE FOR CATALOG

Full information on all sizes and classifications, as well as hundreds of Willey's Tools for other uses.

WILLEY'S CARBIDE TOOL CO.
SOLE MAKERS OF WILLEY'S METAL
1342 W. Vernor Highway Detroit 1, Michigan

DURIMET 20 is recommended for use with about 125 corrosive solutions. Particular attention is given to the service of Durimet 20 where standard 18-8 stainless steel may be limited in resistance to attack. Its resistance to sulfuric acid and its own limitations for this corrosive are thoroughly charted.

* * *

A free copy of this new bulletin on Durimet 20 may be obtained by writing The Duriron Co., Inc., Dayton 1, Ohio, and asking for Bulletin 112.

* * *

Recommended Revision of Commercial Standard for Grading of Diamond Powder Submitted to Industry for Acceptance

A Recommended Revision of Grading of Diamond Powder, Commercial Standard CS123-45, has been submitted to producers, distributors, and users of this product for written acceptance, according to an announcement by the Commodity Standards Division of the National Bureau of Standards.

* * *

DIAMOND powder has many industrial uses as an abrasive. The first edition of the standard was developed by the industry at the request of the War Production Board to conserve materials, and to eliminate confusion resulting from non-uniformity in the grade designations used by the various manufacturers. The present revision was proposed by the Industrial Diamond Association, Inc., and has been endorsed by the Standing Committee for the Commercial Standard.

* * *

THE standard covers six particle size ranges called "micron" sizes, used in fine grinding and polishing, and eight coarser size ranges called "sieve" sizes. A suggested form of identification, to indicate compliance with the Commercial Standard, is included. The revision will be promulgated officially by the National Bureau of Standards if written acceptances are received representing a sufficient majority of the industry, and if there is no valid objection by those concerned.

UPON request, mimeographed copies of the recommended Commercial Standard may be obtained from the Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

* * *

Lincoln Electric to Build New Plant

PLANS for the construction of a complete new manufacturing plant and headquarters offices for the Lincoln Electric Company at East 178th Street and St. Clair Avenue, Cleveland, have been announced by James F. Lincoln, president.

* * *

PRELIMINARY studies for the new plant, which will represent an investment of more than ten million dollars, are being developed by engineers of The Austin Company. It will be situated on a 50-acre tract and will ultimately provide about 25 acres of floor space under one roof.

* * *

THE new facilities will completely replace the company's present plant at 12818 Coit Road, which will be disposed of in the light of traffic problems presented by establishment of the new Lake Shore freeway alongside the plant.

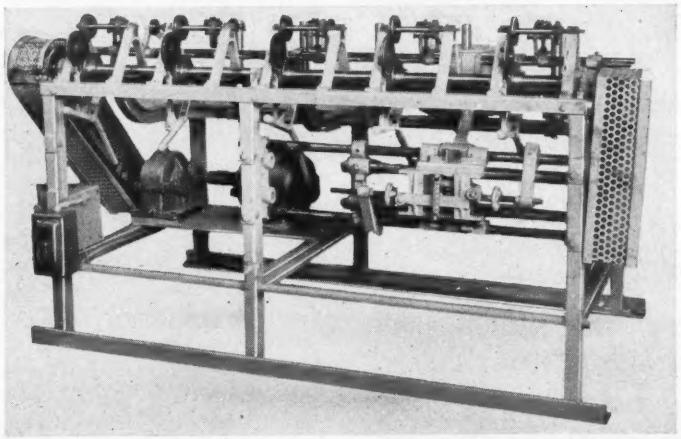
* * *

Carboloy Company to Demonstrate Properties of Hard Metals at A.S.T.M. Show in Detroit

A unique display — designed to demonstrate some of the outstanding physical properties of cemented carbides — was on exhibit by Carboloy Company, Inc., Detroit, Michigan, at the American Society for Testing Materials exposition held at Detroit's Book-Cadillac Hotel in June.

* * *

CEMENTED carbide's high degree of resistance to bending compared with that of steel was demonstrated by means of two long rods of identical size — one of carbide and the other of tempered steel. These bars were mounted so that identical weights hung on their free ends caused the bars to



NO. 300 MULTIPLE SPINDLE SPOOLER

This machine spools fine wire from .005 to .030 diameter and has a spool flange capacity of 7". Wire tension and traverse adjustments are easily made, and spindles can be started or stopped individually. Any desired lay of wire is easily obtained by a simple change of gears. Non friction bearings used throughout.

All Emory spoolers may be adapted to customer's operating conditions.

On Spooling problems consult

ROBERT J. EMORY COMPANY

31 EAST RUNYON STREET NEWARK 5, NEW JERSEY

AVOID COSTLY SHUTDOWNS DUE TO *CORROSION*...

SPECIFY

HAVEG

EQUIPMENT FOR

CORROSION RESISTANCE THAT'S MORE THAN SKIN DEEP

- Agitators
- Baskets
- Blowers
- Fume Duct
- Filters
- Kettles
- Piping
- Pumps
- Tanks
- Towers
- Many Others

HAVEG is a molded structural material that is completely acid and alkali resistant throughout its entire mass . . . it is not a lining nor a coating!

Large size equipment can be molded at low cost in one piece without seams or joints and installation accomplished easily and economically.

Send for Bulletin F-5 for complete design, engineering and application data.

HA-6-47

HAVEG CORPORATION

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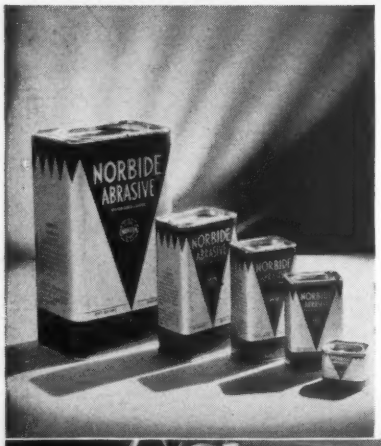

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NORBIDE Abrasive is successfully used for cutting and semi-finishing cemented carbide wire drawing dies. This abrasive is second only to diamond powder in hardness and is 150 times less expensive. Sizes 220 and 240 for ripping; 320F for semi-polishing; 500 to 800 for final finishing.

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bend. By this demonstration the resistance to bending of Carboloy Cemented Carbide was shown to be about three times that of steel.

* * *

A second display dealt with density. Cubes of steel, lead, and Carboloy — all of exactly the same weight — were used to show that carbide metal is nearly twice as dense as steel and half again as dense as lead.

* * *

USE of carbides for accurately measuring the hardness of hardened steels illustrates the extreme hardness of cemented carbides. A chart showed the remarkable extent to which cemented carbide retains this hardness even when heated to red heat — temperatures at which other metals lose their "temper" and become soft. Other displays demonstrated the ability of carbides to take a surface finish of super-mirror-like quality and shock resistant applications.

* * *

New Line of All-Purpose Carbide Bushings Announced by Carboloy Company, Inc.

A new line of standard all-purpose carbide bushings —which can be used to serve a multitude of uses as wear resistant parts where either inside or outside diameter is critical — has been announced by Carboloy Company, Inc., of Detroit. Various sizes of these bushings — now available from stock — are already in use as fine yarn guides in textile machines; as wire guides, and as bushings and collets in Swiss Automatic machines. They can also easily be adapted for valves and orifices in spray gun nozzles; as plug gage bushings, especially on extremely fine instrument work; on guide rolls and feed rolls; and as drill jig bushings.

* * *

The Owens-Corning Fiberglas Corporation Wire and Cable Conference

THE second Annual Wire and Cable Conference, sponsored by the manufacturers of Fiberglas and

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keynoted by the slogan: "Costs Less in More Places", was attended by seventy-one representatives from fifty-one different manufacturing plants early in June at Bedford Springs, Pa.

* * *

AT the Conference, a vast array of technical material was presented covering the forms of yarns and insulating materials in which Fiberglas is available, the places in which these different forms had been found to have their best applications and the practical problems attendant upon the use of these materials in the manufacture of electric wire and cable.

* * *

ROY J. **Black**, Manager of the Electrical Division of the Corporation, served as chairman of the technical sessions, ably assisted by **Fred S. Sampson, Jr.**, Manager of Wire and Cable Sales, who guided the several speakers through a series of highly informative papers, in which a studied effort was made to point out where Fiberglas was of definite advantage, both price-wise and from a utilitarian angle, being careful to distinguish between known factors and those which were strongly indicated as having good possibilities, but on which sufficient experience had not yet been collected to make specific recommendations.

* * *

SANDWICHED between the sessions was a trip to the Huntingdon "Fiberglas" plant, where the processes of spinning the glass fibers, the manufacture of yarns, various "package" winding methods and a series of practical demonstrations in the techniques of applying yarns, fillers and coatings were shown, to illustrate many points that had been covered in the papers.

* * *

ONE of the interesting points made by **Harold Boeschenstein**, President of the Corporation, in his opening address was that the average price of Fiberglas yarn had fallen from $2.02 in 1938 to 89 cents per pound in 1948, a trend that had continuously enlarged the field for the product and that gave

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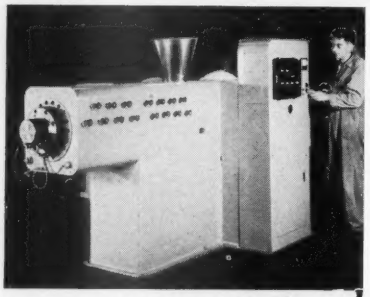

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force to the slogan: "Costs Less in More Places".

* * *

BESIDES the exposition on the numerous forms of yarns that can be used by the industry, perhaps the most valuable information given to those who attended the Conference was a series of discussions on the practical problems that have arisen in the use of Fiberglas and the proper means of handling the material to secure the best results. This was mill experience data, passed on to others for their guidance.

* * *

AMONG the types of wire covered were building cable, portable cords, flexible cords, heat resistant wires, heater cords, Type R wire, pyrometer wire, service entrance cable, ignition cable, magnet wire, lead wire, aircraft wire, radio and instrument wire, battery cable and automotive wire.

* * *

COPIES of the papers were provided for each guest in a bound volume that also contained samples of various forms of yarns and tapes, put together in such manner that it is a veritable reference work on Fiberglas for wire applications.

* * *

AMONG the interesting things referred to as a future possibility is a new practically pure silica fiber that has withstood sustained heat of 1800° without affecting its properties.

* * *

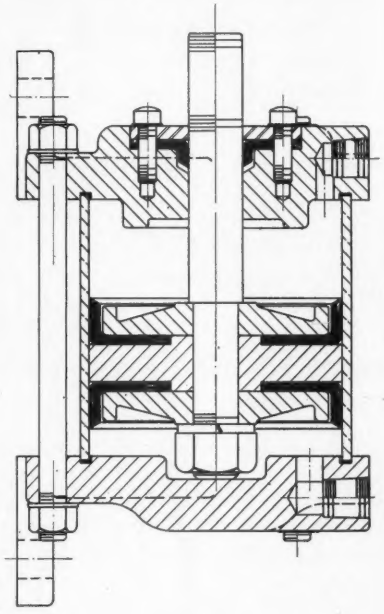
DURING the plant visit, a fifteen-minute broadcast went out over the air waves. In this Mr. Black explained the purpose of the Conference, stating: "The . . . conference . . . is a work session in the strictest sense. Our guests are engineers and production people who have the responsibility of specifying the materials that go into the products manufactured by the companies they represent." He called attention to the tremendous importance of wire and cable to our daily living, emphasizing the need for the best materials to make apparatus upon which we rely dependable and low in cost through constant research and improvement.

JLE Adds Low-Cost Air Cylinders

THE James L. Entwistle Co., 43 Church Street, Pawtucket, R. I., World's leading manufacturer of spark-testing equipment for the wire industry, has just announced production of a standard-use low-cost air cylinder.

* * *

THE JLE Air Cylinder is available in standard bore sizes from 1½" to 10" in diameter and can be made



to any stroke specified. Top operating pressure is 110 lbs. per sq. inch. JLE Air Cylinders are available in five standard mountings.

* * *

JLE originally designed and produced the Air Cylinder shown here for use on their own machines with the idea of developing a cylinder that would do the best possible job at the most economical price. After years of constant pneumatic research the firm perfected the present cylinder and are now offering it for the first time in the open market.

* * *

COMPLETE details and prices are available on request.

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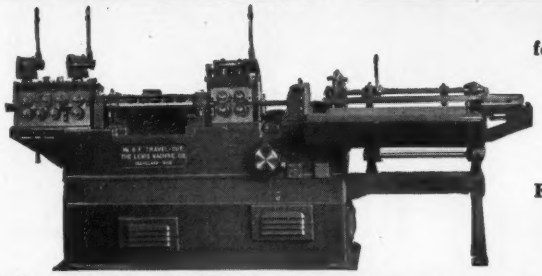

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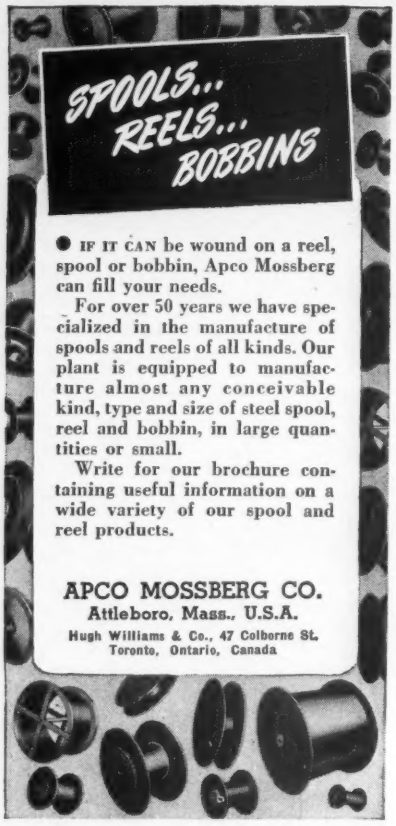
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G.E. Completes New Plant to Make Silicone Materials

A new multi-million dollar chemical plant for the manufacture of silicone materials has been completed here by the Chemical Department of the General Electric Company, it was announced recently by **Harry K. Collins**, manager of the Resin and Insulation Materials Division.

* * *

IN partial operation for about a year, the new plant is now ready to produce the war-developed materials at full capacity to meet an ever-increasing demand by industry for the various types of silicone products. These products are processed in the form of rubber, oils, greases, resins and water-repellents.

* * *

CONSISTING of six buildings and a chemical tank farm located on a 15-acre plot, the Waterford plant currently employs approximately 150 persons.

* * *

DERIVED from sand and processed by a completely new form of chemistry, silicone materials are noted for their ability to withstand a wide range of temperatures from approximately 70°F below zero to 520° above, a feature which makes them particularly applicable for various types of equipment used by the Armed Services in all temperature zones.

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Racks may be used as single units or tiered

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PORTER *Cutters*

Send for folder showing the newly designed *improved* Porter Cutters.

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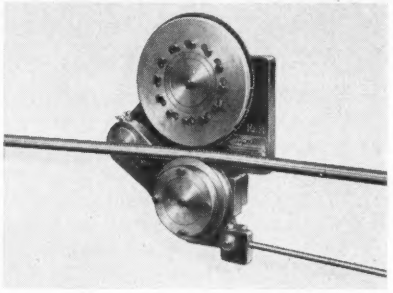
Acromark Develops New Friction Type Rod, Wire and Cable Marking Unit

MARKING, at the speed of production on steel, iron, brass, lead and plastic rod, tubes or cable can now be accomplished with a new unit developed by **The Acromark Company**, Elizabeth, N. J. it is claimed by the manufacturer.

* * *

THIS marking unit is designated as Marking Machine No. 14. It consists of a ball bearing marking roll that carries engraved steel segment dies that are held in position by means of a face plate with flange



Acromark Marking Machine No. 14. * *

that fits into channels of segment dies. Screw holes are elongated to permit changing of segment dies by simple loosening of the screws and a slight turn of the face plate.

* * *

THIS marking roll is mounted on an angle type of base which can in turn be bolted to a bench or stand. At one end of the base is a pivoted arm also bearing mounted and on the end of the arm a ball bearing grooved pulley is mounted. This pulley is interchangeable for different size grooves to suit the various diameters of rod, tube or wire.

* * *

A projection beneath the base carries an eccentric adjustment operated by a hand lever to provide the adjustment for diameter of rod or tube and for depth of marking.

* * *

IN operation the free rotation of both the marking roll and the grooved pulley permits the rod, tube or cable to be fed through at

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After pickling, BORAX can be applied with one dip; dries in three minutes in an oven temperature of 150° F. to provide a coating that will not check or flake off in storage. Dissolves readily in water and is dust free. BORAX, other than being an excellent vehicle for picking up the drawing lubricant, is rust inhibiting and a natural flux that will facilitate the making of good butt welds. Use BORAX to make better wire at less cost. Used in many mills.

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The Oakite CrysCoat* Process

for coating ferrous rods and wire, gives 5 big advantages:

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STRONGLY built, this unit is suitable for applying the pressure necessary for marking materials ranging from soft plastics to tool steel, and continuous use in rod mills, lead-jacketed cable plants and plastic insulated cable plants has proven the practicability of the unit. Further details will be gladly furnished upon application to the Acromark Company, 423 Morrell Street, Elizabeth 4, N. J.

* * *

Ceco Steel Products Occupies New Office Building

THE general offices of **Ceco Steel Products Corporation,** manufacturer of metal construction products, were moved June 25 and 26 into a new office building at 5601 West 26th Street, Chicago 50, as another step in the firm's country-wide expansion program. The general offices previously had been located in the firm's Plant No. 1, adjacent.

* * *

CECO'S expansion program now embraces 14 plant-warehouses and 23 district offices located from coast to coast.

* * *

A new plant and office buildings have just been erected in Houston, Texas, on an eight-acre tract at 1902 Webster Street.

* * *

EARLIER this year in Los Angeles, a new warehouse bay was added to the Ceco plant at 1450 Mirasol Street.

NOTICE TO SUSCRIBERS

WIRE & WIRE PRODUCTS BUYERS GUIDE and Year - Book of the Wire Association

The 1948 Edition of this useful directory may be obtained by subscribers at 40% discount from the list price of $5.00 per copy. So when ordering your subscription to WIRE and WIRE PRODUCTS, if you want a copy of the BUYERS GUIDE, please enclose $3.00, or send the order and ask us to bill you. Members of the WIRE ASSOCIATION will continue to receive a copy of the BUYERS GUIDE as part of the service extended to them, and the cost is included in the dues.

To all others the price remains as heretofore $5.00 per copy.

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A Progress Report on Experimental Development of Surface Carbon Restoration in Decarburized Coiled Rod and Wire Material

(*Continued from page 689*)

coil an increase in carbon content and penetration had taken place clear into the .036″ depth. However, on the other hand, on the top coil a decrease in carbon content had taken place from the .012″ depth outwardly, and an increase in content from .018″ to .036″ inwardly, indicating that carbon diffusion can take place both inwardly and outwardly depending on the carbon potential or pressure balance of the carburizing gas. In this case it appears that the carbon potential of the gas with respect to this type of steel and temperature, was equivalent to about .48% carbon.

* * *

General Conclusions

BASED on the data obtained and observation of comparative results, the following factors can be listed as important in order to obtain successful results in the process:

* * *

1. THE nitrogen carrier gas should be of uniform and consistent dew point or water vapor content in order to accurately establish the volume of hydrocarbon gas required to obtain a consistent carburizing activity or potential throughout the entire cycle, and also from charge to charge. With uniform and consistent dew points, an equilibrium between the various gas components will be established and maintained at the various temperatures.

* * *

2. UNIFORM and accurate control of hydrocarbon gas flow.

* * *

3. UNIFORM temperature of steel throughout the entire load, as the carbon restoration rate in form of absorption and diffusion varies greatly with differences in temperature throughout the charge.

* * *

4. THE process should be carried on with the temperature of steel above the upper critical or in the austenitic state in order to obtain reasonable rapidity of carbon absorption and depth penetration.

* * *

5. SUFFICIENT flow of hydrocarbon bearing atmosphere gas with suitable turbulence or agitation throughout the charge being processed.

* * *

IN reviewing the results obtained in these tests and analyzing the successful possibilities of the process in respect to commercial practice, it should be considered that in a combination carbon restoration and spheroidizing treatment the problems and requirements of carbon control are twofold, as definite values of hydrocarbon gas flow are required to obtain the proper carbon potential for each of the treatments at two different tempera-

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Brass	Resistance
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Music Wire	Tag Wire
Nickel Silver	Trolling Wire
Oil Tempered	Leader Wire
Phosphor Bronze	
Picture Wire	

THE MALIN & CO.
2514 Vestry Ave., Cleveland 13, Ohio

tures, namely, 1550° and 1345° which might be described in the following manner:

* * *

1. PROVIDE the proper carbon potential in the carburizing gas to restore lost carbon to the decarburized areas in content equal to the core section and properly distributed. In this case, this carbon potential provides the proper rate of carburizing activity with the steel at 1550°F. With changes in work temperature, adjustment of carbon potential is required to maintain the same rate of restoration activity.

* * *

2. ASSUMING that carbon restoration has been properly completed in that cycle, it is necessary to readjust the hydrocarbon gas flow and carbon potential required to protect the restored carbon during the spheroidizing treatment at 1345°F. without carburization or decarburization. Should the carbon potential be too high or above that required to maintain carbon equilibrium at 1345°F. carbon absorption at the extreme surface would take place but the rate of diffusion at this temperature is greatly retarded, the result being a high carbon skin. On the other hand, should the carbon potential be too low to maintain the restored carbon at the surface, a slight surface decarburization would take place resulting in a low carbon skin.

* * *

FROM the above, it can be seen that two sets of carbon potential values have to be established in order to obtain perfect ultimate results in such a combination treatment.

* * *

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Disposal of Pickling Liquors

(*Continued from page 668*)

grinding, screening and air classification and the choice of the method must be based on the cost of the material delivered to the agitators with due consideration to the problem of handling the unslaked lime.

* * *

ALTHOUGH the problem of neutralizing the acid and precipitating iron and the dewatering of the resulting pulp does not present any difficulties, it must be realized that the disposal of the resulting sludge either as a thickener discharge or a filter cake still represents a major problem, especially if a large area of waste land, preferably with a natural depression is not available close to the plant.

* * *

WHEN the problem of handling the pickling liquor is approached by the management, or its engineering department, it is often assumed that the treatment will fall into one of the three classes mentioned above and that a standardized plant layout will take care of the problem.

* * *

UNFORTUNATELY, this is not the case and each one should be approached as an individual engineering problem, regardless of the expense of such an investigation. Such factors as the variations in flow and concentrations of salts in the wash waters, periodicity and concentrations of the strong liquors, quality of the lime or limestone and the requirements of the State or municipal authorities must be studied before a preliminary estimate on the type and size of treatment plant can be made. A survey of our test data to date has indicated that the equipment sizes cannot be safely predicted in the absences of tests on samples from each plant.

* * *

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product possibilities as well as actually to lengthen the life and increase the usefulness of steel cables in many services where wire rope is already used. The coating is applied by extrusion.

* * *

PRODUCT-WISE, the possibilities of Rochester Wirelon include automotive brake and speedometer cable, aircraft control cables, sash cords, agricultural and earth-moving machinery, artificial limbs, typewriter carriage returns, textile machinery, fishing lines, and others running from grain-cleaning equipment to slim, crystal-like dog leashes and swank luggage handles. Wirelon will be available in diameters ranging from 1/32-inch to 1-inch or greater.

* * *

THE Du Pont nylon coating is unaffected by oils, cleansing agents, marine growths, and all alkalies. It is not harmed by such acids as nitric, hydrochloric, or sulphuric in concentrations up to approximately 1%. Temperature tests show that Wirelon ropes operate well at high and low temperatures. The ropes retain their flexibility whether wet or dry.

* * *

THE coating is being used by Rochester in the manufacture of three distinct types of rope. In the first, nylon is extruded onto single strands of wire, which can then be used in many services where more expensive fully formed ropes were heretofore required. The second type is more flexible and is made by applying the plastic to the outside of wire ropes that are already completely formed. Still more flexible than either of the other types, is nylon-wire rope made by the third method, in which individual strands are coated with nylon and the coated strands then closed into a finished rope.

* * *

IN one fatigue test to which a bare cable and a nylon-covered cable of the same size and construction were both subjected under identical conditions, the bare cable was virtually destroyed after 60,000 reversals, suffering 60 broken wires per strand lay. When the cable with the nylon coating was examined after the same abuse, only one broken wire was found in the entire rope.

* * *

THE plastic coating helps reduce the possibility of the rope's birdcaging, fanning out, or kinking when strains are suddenly applied, and protects against injury from steel splinters.

* * *

Booklet Covers Silicone Products

A 30-page illustrated bulletin (No. CDR-57) describing in detail G-E silicone products has been issued by the **General Electric Company's** Resin and Insulation Materials Division. The bulletin describes the new G-E silicone resins, oils, greases, water repellents, and rubber together with their many industrial uses. Charts and tables are included for handy reference.

* * *

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Oakite Products, Inc., New York, N. Y.
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Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

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Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Company, Cleveland, Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
U. S. Steel Export Company, New York, N. Y.

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Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

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Pacific Coast Borax Corp., New York, N. Y.

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Entwistle, Jas. L. Co., Pawtucket, R. I.

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Sauereisen Cements Co., Pittsburgh, Pa.

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Nopco Chemical Co., Harrison N. J.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Potter, Neil C., Newark, N. J.
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Swift & Company, Chicago, Ill.

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Vascoloy-Ramet Corp., North Chicago, Ill.
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DIES—Cold Heading
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Hoosier Carbide Die Co., Ft. Wayne, Ind.

DIES—Diamond
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Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Cochaud Wire Die Corp., New York, N. Y.
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Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.

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Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
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Willey's Carbide Tool Co., Detroit, Mich.

DIES—Pointing
Sjogren Tool & Machine Co., Auburn, Mass.

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Carboloy Co., Detroit, Mich.
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Willey's Carbide Tool Co., Detroit, Mich.

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Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
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Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
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DIES—Special Shapes, Etc.
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DIES—Tantalum Carbide
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Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tubing
Hoosier Carbide Die Co., Ft. Wayne, Ind.

DIES—Tungsten Carbide
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Carboloy Co., Inc., Detroit, Mich.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp. Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

WHERE TO BUY, Continued

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros., & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Hayes C. I., Providence, R. I.
Morrison Engineering Corp., Cleveland, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Hayes, C. I., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Healing, Strand
Trauwood Engineering Co., Cleveland, Ohio

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING ENGINEER—Consulting
Spowers, W. H., Jr., New York, N. Y.

GALVANIZING EQUIPMENT—
Hanson-Van Winkle-Munning Co., Matawan, N.J.
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GAVANIZING FLUXES—
Hanson-Van Winkle-Munning Co., Matawan, N.J.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HAMMERS—Swaging
Sjogren Tool & Machine Co., Auburn, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Martin, Glenn L. Company, Baltimore, Md.
Owens Corning Fiberglas Corp., Toledo, O.
Standard Varnish Wks., Staten Island, N. Y.
Twitchell, E. W., Philadelphia, Pa.
Warren Thread Works, Inc., W., New York, N.Y.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.
Swift & Company, Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Barbed Wire
Reed & Richards Transatlantic Co., Inc., New York, N. Y.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery Inc., Pawtucket, R. I.

MACHINERY—Copper Wire Drawing and Rolling
Aetna Standard Eng'g Co., The, Youngstown, O.
American Insulating Mach'y Co., Phila., Pa.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Porter, H. K. Inc., Everett, Mass.
Reed & Richards Transatlantic Co., Inc., New York, N. Y.
Shuster, F. B. Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Aetna Standard Eng'g Co., The, Youngstown, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

WHERE TO BUY, Continued

MACHINERY—Extruding
Modern Plastic Machinery Co., Lodi, N. J.
National Erie Corp., Erie, Pa.
Robertson John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Modern Plastic Machinery Co., Lodi, N. J.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail, Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.
Fab-Weld Corporation, Philadelphia, Pa.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Black Industries, Cleveland, Ohio
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Reed & Richards Transatlantic Co., Inc., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Plating Electrolytic
Hanson-Van Winkle-Munning Co., Matawan, N.J.

MACHINERY—Pointing
Aetna Standard Eng'g Co., The, Youngstown, O.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Black Industries, Cleveland, Ohio
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Erie Corporation, Erie, Pa.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sjogren Tool & Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Mach'y Exch. (Used), New York, N.Y.
Modern Plastic Machinery Co., Lodi, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Reed & Richards Transatlantic Co., Inc., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Steel Bale Ties
Reed & Richards Transatlantic Co., Inc., New York, N. Y.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Reed & Richards Transatlantic Co., Inc., New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Erie Corp., Erie, Pa.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Physical
American Optical Co., Buffalo, N. Y.
Scott Testers, Inc., Providence, R. I.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila, Pa.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
National Erie Corp., Erie, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila, Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna Standard Eng'g Co., The, Youngstown, O.
Industrial Ovens, Inc., Cleveland, Ohio
Modern Plastic Machinery Co., Lodi, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
Aetna Standard Eng'g Co., The, Youngstown, O.
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Reed & Richards, Transatlantic, Inc., New York,
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MACHINERY—Wrapping Wire Coils
Angier Corporation, Framingham, Mass.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail, Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.
Fab-Weld Corporation, Philadelphia, Pa.

MATERIAL—Resistance Heating Strand
Trauwood Engineering Co., Cleveland, Ohio.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling, John A. Sons Co., Trenton, N. J.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
U. S. Steel Export Co., New York, N. Y.

NAIL DIE GRINDERS
Reed & Richards Transatlantic Co., Inc., New York, N. Y.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Chase Brass & Copper Co., Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

WHERE TO BUY, Continued

OPTICAL EQUIPMENT—Metallurgical
American Optical Co., Buffalo, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Angier Corp., The, Framingham, Mass.
Crepe-Kraft Division
National Waterproof Papers, Inc., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Angier Corp., The, Framingham, Mass.
Crepe-Kraft Division
National Waterproof Papers, Inc., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING—Hooks, etc. Acid Resisting
Gordon, Clark E., Detroit, Mich.

PICKLING TANK LININGS—
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I

PLATING PROCESS—Electrolytic
General Chemical Division
Allied Chemical & Dye Corp. New York, N.Y.
Hanson-Van Winkle-Munning Co., Matawan, N.J.

PNEUMATIC CYLINDERS
Entwistle, James L. Co., Pawtucket, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdy & Mach. Co., Trenton, N.J.
Sjogren Tool & Machine Co., Inc., Auburn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

PULLERS—Wire
Scudder, E. J., Fdrv. & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STANDS—
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Hazardville, Conn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Mill
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wooden
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing, Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
Eastwood Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
Armco Steel Corp., The Middletown, Ohio

RODS—Wire—Non-Ferrous
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's, John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel, Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Armco Steel Corp., The Middletown, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison N. J.
Potter, Neil C., Newark, N. J.
Procter & Gamble, Cincinnati, Ohio.
Swift & Company, Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp.,

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Chase Brass & Copper, The Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Armco Steel Corp., The Middletown, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

TANK—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Penna.

TINSEL—Cords, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Electric Conductor
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Electric Resistance
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Lame, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Thread, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Thread, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy. Inc. Pawtucket. R. I.

TUBE BENDERS AND FORMERS—
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ruesch, H. J. Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
General Electric Co., Schenectady, N. Y.
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Sciaky Bros., Inc., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y. Co., Phila., Pa.
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
Armco Steel Corp., The Middletown, Ohio
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Chase Brass & Copper, The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Co., Inc., New York, N.Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Armco Steel Corp., The Middletown, Ohio
American Steel & Wire Co., Cleveland-Chicago & New York.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper, The, Waterbury, Conn.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., of Colorado Fuel & Iron Corp., Buffalo, N.Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Nickel & Nickel Alloy
Eastwood-Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N. Y.

WIRE—Music
American Steel & Wire Co., Cleveland, Chicago-New York.
Columbia Steel Co., San Francisco, Calif.
Ecca Machine Corp., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
Paramount Wire Co., New York, N. Y.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE—Nickel Silver and Phosphor Bronze
Chase Brass & Copper, The, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Chase Brass & Copper, The, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., New York, N.Y.
Paramount Wire Co., New York, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRESERVING—Paper and Cotton
Paramount Wire Co., New York, N. Y.

WIRE—Spring
Armco Steel Corp., The Middletown, Ohio
American Steel & Wire Co., Cleveland - Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
Armco Steel Corp., The Middletown, Ohio
American Steel & Wire Co., Cleveland-Chicago-New York.
Columbia Steel Co., San Francisco, Calif.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Paramount Wire Co., New York, N. Y.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting—
Paramount Wire Co., Inc., New York, N. Y.
Pittsburgh Cut Wire Co., Pittsburgh, Pa.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Chase Brass & Copper Co., The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Paramount Wire Co., New York, N. Y.

WRAPPING PAPER—Creped
Augier Corporation, Framingham, Mass.
Crepe-Kraft Division
National Waterproof Papers, Inc., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.
Warren Thread Works, Inc., W., New York, N.Y.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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August, 1948

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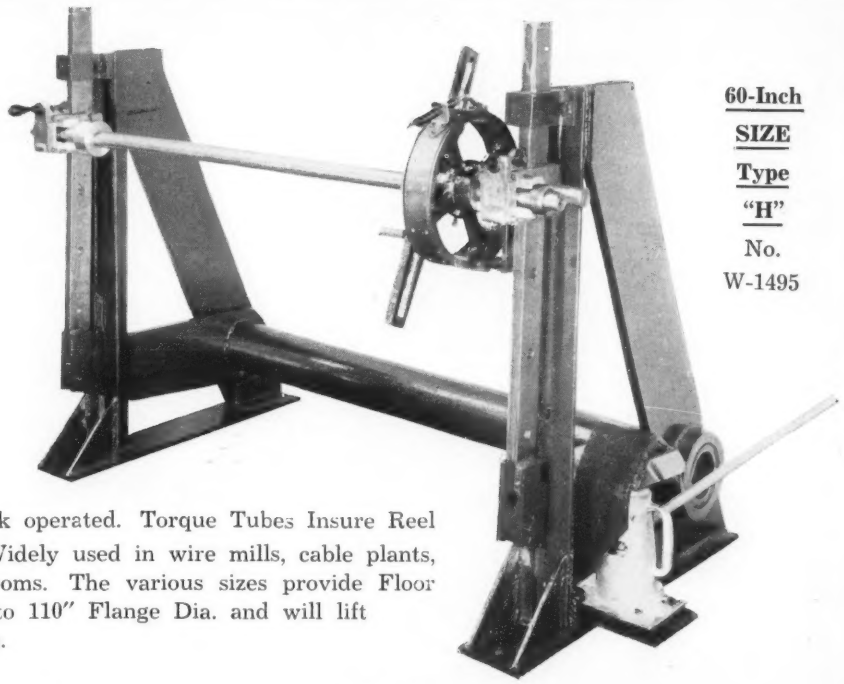

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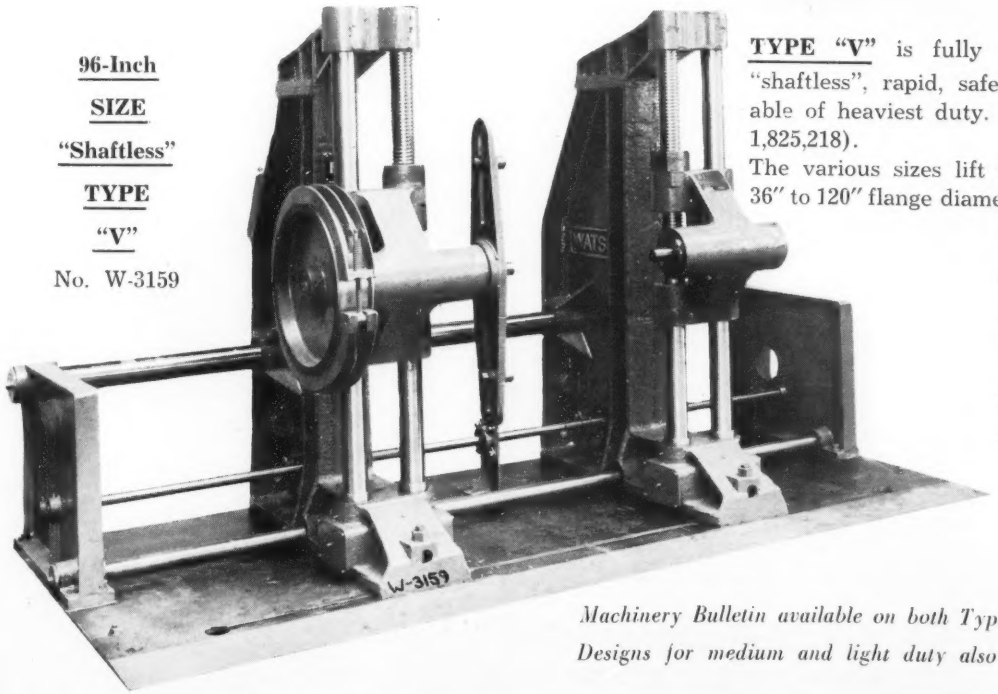

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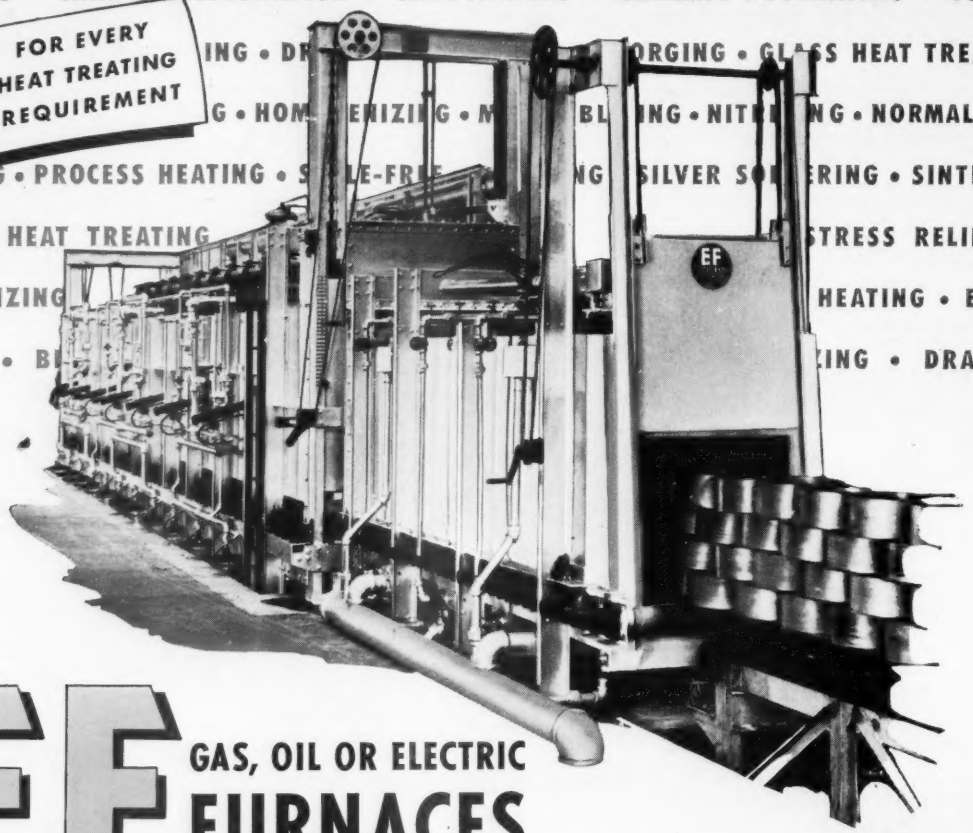

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